ALBERTA POWER COMMISSION

1965

ANNUAL REPORT

GOVERNMENT OF THE PROVINCE OF ALBERTA

ANNUAL REPORT

OF THE

ALBERTA POWER COMMISSION

FOR THE YEAR ENDING

DECEMBER 31, 1965

EDMONTON

J. G. MacGREGOR

CHAIRMAN

February 8, 1966

The Honourable A. R. Patrick
Minister of Industry & Development
Legislative Building
EDMONTON, Alberta

Sir:

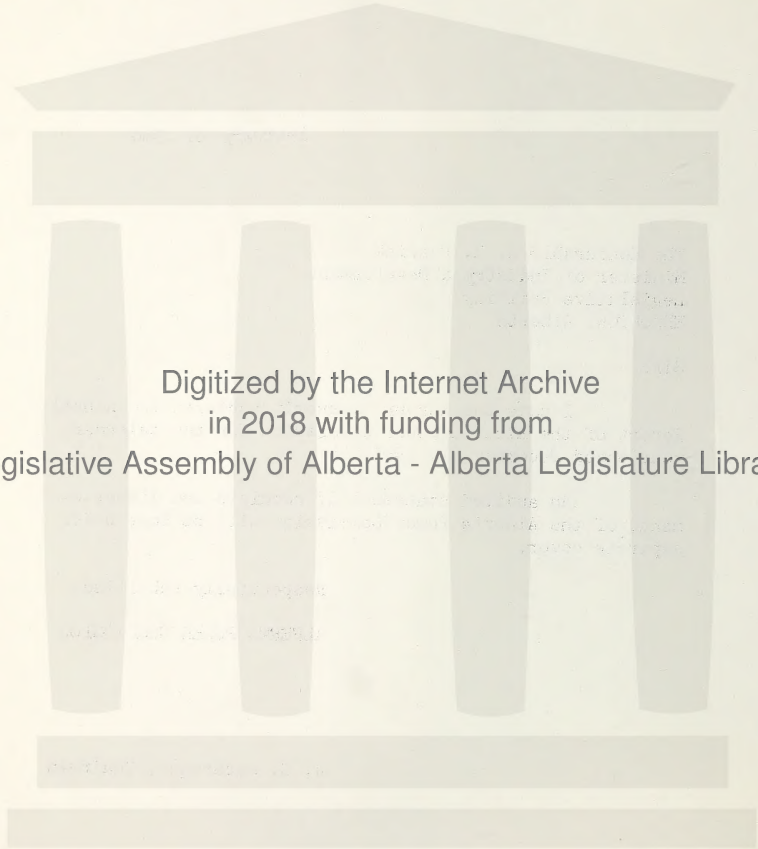
I have the honour to submit herewith the Annual Report of the Alberta Power Commission for the calendar year ended December 31, 1965.

An audited statement of receipts and disbursements of the Alberta Power Commission will be sent under separate cover.

Respectfully submitted,

ALBERTA POWER COMMISSION

J. G. MacGregor, Chairman



ALBERTA POWER COMISSION

1965

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J. G. MacGregor	Chairman
J. E. Oberholtzer	Member
W. C. Whittaker	Member
J. L. Reid	Member & Secretary

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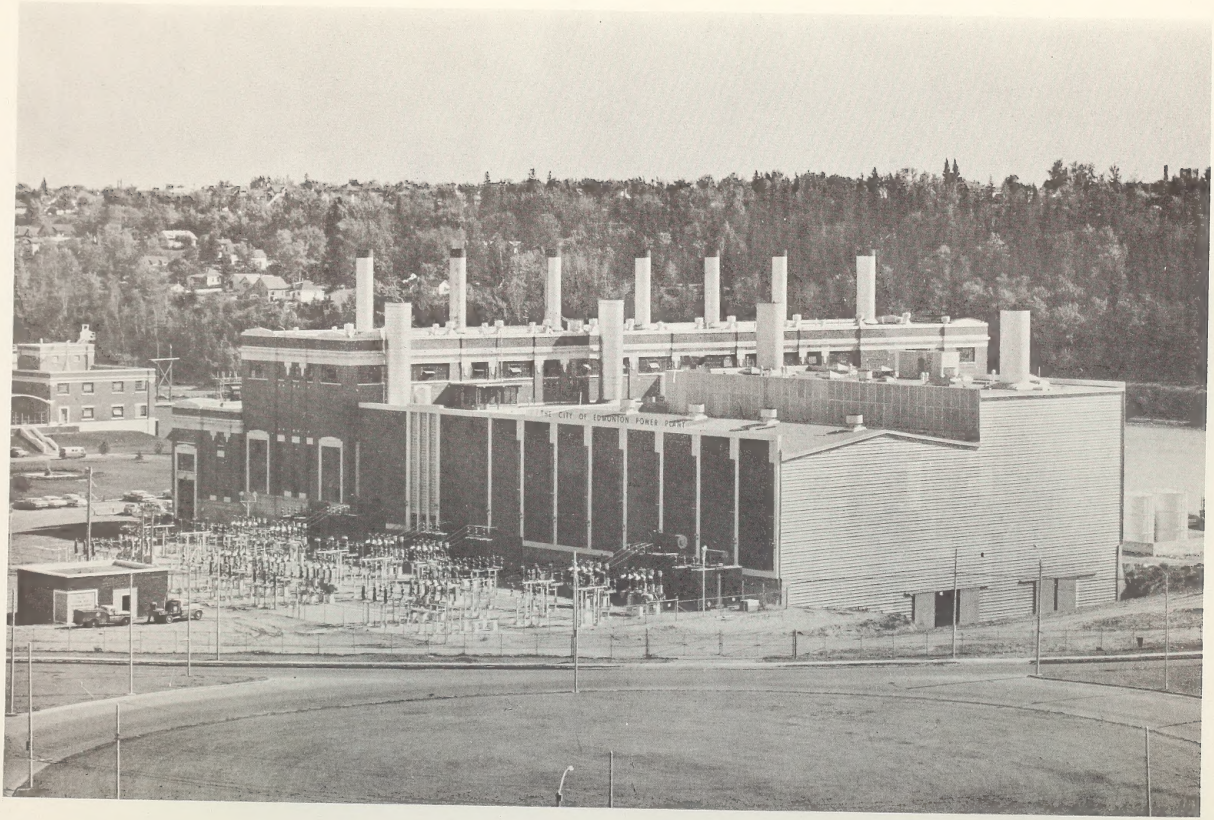

CITY OF EDMONTON POWER PLANT

PREFACE

The Alberta Power Commission's duties, as set out under the Power Commission Act, are of a regulatory and supervisory nature. The Commission does not own or operate any power plants, transmission lines or distribution systems. In this respect it is different from the Power Commissions in all the other provinces except Prince Edward Island and Newfoundland. Many of its duties are covered by Section 6 of the Power Commission Act, which is as follows:

"Whenever required so to do by the Lieutenant Governor in Council, the Commission shall inquire into, examine and investigate -

(a) water powers and water privileges in Alberta, their value and capacity;

(b) the existing facilities for the manufacture and distribution of power in Alberta;

(c) such other matters relating to power and its distribution in Alberta as the Lieutenant Governor in Council from time to time may require; and shall report thereon to the Lieutenant Governor in Council."

The Commission feels that, at the present time, its principal duties are threefold:

1. The collection of statistics of the Electric Utility Industry in the Province, and the study of these statistics so that the people of the Province will have a true picture of the industry.
2. The study of hydro-electric sites and other power possibilities in the Province. The Commission also has been engaged in a study of the existing network of transmission lines in the Province with

particular reference to more extensive interconnection which will ensure the most efficient use of the large generating units which are already in operation and of those anticipated in the future.

3. Farm Electrification - This is a phase of its work to which the Commission devotes much of its time. The main network of farm electrification lines is completed and from here on, except for extensions which are being made into the homestead areas mainly in the Peace River country, the additional farms to be electrified will be adjacent to existing lines. While the construction phase of farm electrification is almost over, problems of operating the farm lines, some of which are now over fifteen years old, are taking much more time. The Commission is constantly engaged in studying new operating problems as they come up.

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ALBERTA POWER COMMISSION

ANNUAL REPORT

For Year Ending December 31st, 1965.

Alberta had another very gratifying year in 1965. The four bases upon which the province's progress stands; agriculture, mineral production, construction and manufacturing have all presented pleasing prospects. Farm cash income was well up over the previous year. The value of minerals produced rose nine per cent. The building permits issued kept construction well ahead of the previous good year and the manufacturing industry experienced a six per cent higher output. In the meantime, the province's population increased by some 19,000 to a total of 1,451,000. In addition to a high rate of increase in all these, the discovery of more and more petroleum products north of the 55th Parallel of Latitude has been very encouraging with the new Rainbow field holding the spotlight at the moment.

Accompanying these activities has been a related increase of the order of eleven per cent in the output of electricity. The KWH generated per capita--another good indicator--has increased from 3,209 to 3,541. Ten years ago, in 1955, this per capita figure was 1,621 so on the average every person in Alberta has available to serve him over twice as much electricity as he did ten years ago. This is an indication that the province is swinging over to an industrial economy.

Producing and distributing this greatly increased output of electricity has meant not only the continued expansion of power plants but has also meant greater expansion in one phase of the electrical industry which receives but scant recognition; that is, the great

increase in the mileage of high voltage transmission and interconnecting lines.

The increase in the use of electricity in Alberta during the past year is indicated by the following short summary. The figures compiled in it and throughout this report are confined to the Electric Utility Industry and are comparable to those presented by the Dominion Bureau of Statistics under the category of "Utilities". Previous reports had a Table 8 which compared the miles of pole line with the corresponding figures for nearby provinces and for Canada as a whole. Due to a change in the Dominion Bureau of Statistics' method of compiling figures, it will not be practical to continue this table. In its place we have substituted one showing the increase in Alberta's pole line mileage over the years. The format on Tables 17 and 20 has also been changed from that of former years.

K.W.H. Generated and Peak Load - The increase in KWH generated over that of the previous year was 11.2%. Thermal plants generated 72.4% of the KWH produced. Of the total output, internal combustion plants accounted for about the same proportion (2.8%) as they did during the previous year. This power, of course, is mainly that generated by Northland Utilities Ltd. and Canadian Utilities Ltd. in the Peace River country and includes the power generated by gas turbines at Valleyview. The actual peak load on the interconnected system in the province was 1,096 MW, an apparent increase of over 10%.

Transmission lines in the province increased by 687 circuit lines to a total of 13,839, which excludes 3,137 miles of company-owned farm lines which were formerly shown in Table 17. Distribution line

mileage increased to 6,346. The total circuit mileage of all farm lines increased by 1,095 miles, so that the total farm mileage at the end of 1965 was 45,847. The total circuit mileage of all power lines in the province at the end of December, 1965, was 66,032.

The figures in Tables 1 to 7 inclusive, which follow, are comparisons with the other Prairie Provinces and with Canada as a whole. Except for those marked with an asterisk (*), the figures used are those obtained from the Dominion Bureau of Statistics.

Table No. 1 shows the capacity in M.W. net of the Utility Electric Stations in Canada for the past several years.

TABLE NO. 1

Capacity of Utility Electric Stations

M.W. Net

Year	Alberta *	Canada	Saskatchewan	Manitoba
1953	372	11,687	347	561
1954	405	12,479	356	561
1955	477	13,422	394	637
1956	572	12,463 (1)	415	637
1957	596	13,444	452	644
1958	718	14,758	529	741
1959	750	16,937	670	757
1960	917	18,419	737	1,024
1961	947	19,492	754	1,063
1962	1,092	20,383	751	1,065
1963	1,137	21,200	836	1,068
1964	1,178		925 (2)	1,060 (2)
1965	1,326			

Increase during the 10 year period ended 1963

	Alberta	Canada	Saskatchewan	Manitoba
1953-1963 Increase:	765	9,513	489	507
Per cent Increase:	206%	81%	141%	90%

Increase Alberta: 1955 to 1965 = 178%

* Except for Alberta, the figures from 1953 to 1963 have been taken from D.B.S. publications. Alberta figures are those compiled by the Alberta Power Commission.

(1) In 1956, the D.B.S. changed its classification of statistics from Central Stations to Utilities.

(2) 1964 figures for Saskatchewan & Manitoba are preliminary estimates provided by D.B.S.

Table No. 2 shows the growth of K.W.H. generated net during the past several years.

TABLE NO. 2

Electric Energy Generated Net by Utilities

(Millions of K.W.H.)

Year	Alberta	Canada	Saskatchewan	Manitoba
1953	1,298	53,340	1,161	2,791
1954	1,485	55,334	1,280	2,937
1955	1,707	61,642	1,409	3,102
1956	1,996	68,845	1,537	3,331
1957	2,249	71,522	1,678	3,341
1958	2,474	75,953	1,809	3,214
1959	2,830	83,049	1,998	3,598
1960	3,126	89,156	2,182	3,690
1961	3,451	89,389	2,422	3,786
1962	3,767	92,096	2,594	4,305
1963	4,141	93,501	2,875	4,785
1964	* 4,596		3,202 (1)	4,915 (1)
1965	* 5,138			

Increase during the 10-year period ended 1963

Year	Alberta	Canada	Saskatchewan	Manitoba
1953-1963 Increase:	2,843	40,161	1,714	1,994
Per cent Increase:	219%	75%	148%	71%

Increase Alberta: 1955 - 1965 - 201%.

All figures for 1963 and prior years have been taken from D.B.S. publications.

* 1964 and 1965 figures for Alberta are compiled by the Alberta Power Commission.

(1) 1964 figures for Saskatchewan and Manitoba are preliminary estimates provided by D.B.S.

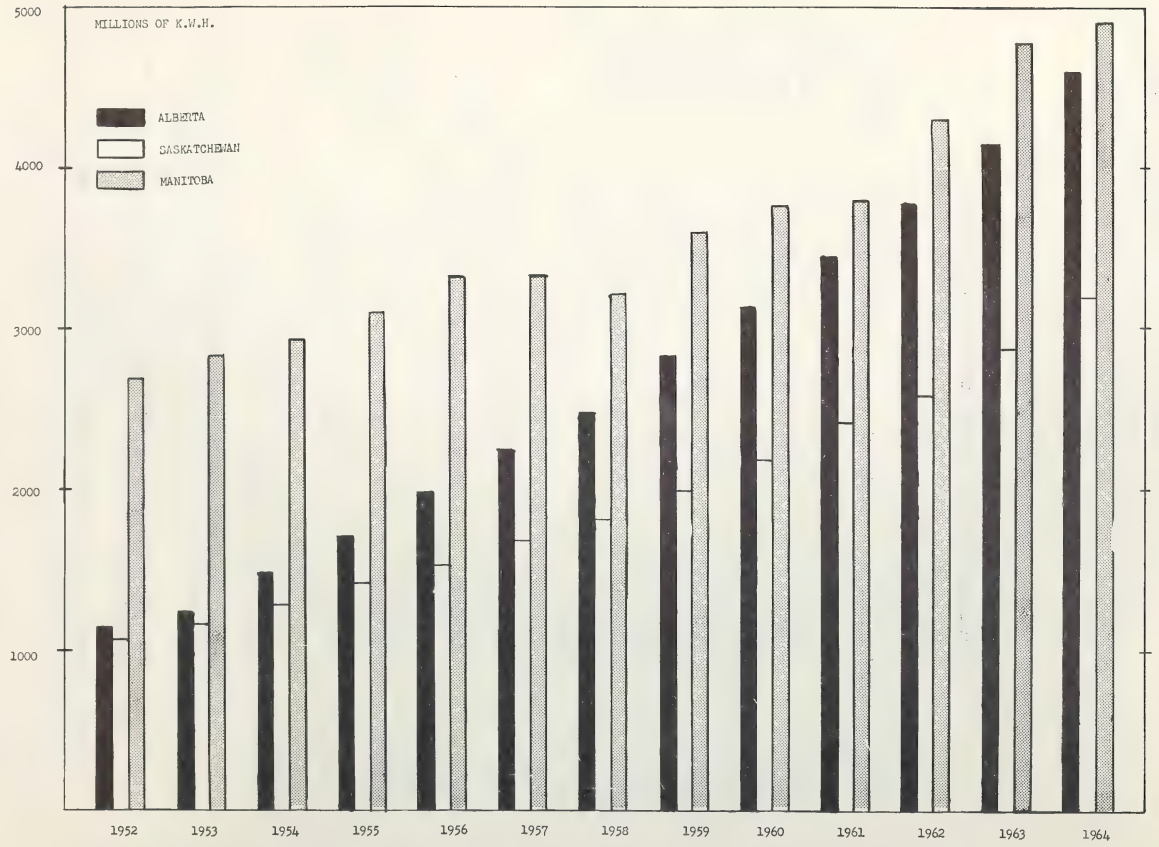


CHART 1 - ELECTRIC ENERGY GENERATED BY UTILITIES - PRAIRIE PROVINCES 1952-1964.

TABLE NO. 3

Annual K.W.H. used per Domestic and Farm Customer

Year	Alberta	Canada	Saskatchewan	Manitoba
1953	1,624	3,008	1,878	4,960
1954	1,865	3,271	2,072	5,229
1955	1,975	3,500	2,483	5,420
1956	2,256	3,740	2,361	5,636
1957	2,373	3,960	2,577	5,895
1958	2,532	4,128	2,696	6,113
1959	2,859	4,338	2,974	5,993
1960	2,989	4,490	3,019	6,184
1961	3,224	4,660	3,112	6,535
1962	3,417	4,870	3,440	6,468
1963	3,595	5,084	3,688	6,630
1964	3,813		3,918	6,919

These are all D.B.S. figures.

Figures for 1964 are preliminary estimates.

TABLE NO. 4

Costs in Cents per K.W.H. Domestic and Farm Customers

Year	Alberta	Canada	Saskatchewan	Manitoba
1953	2.91	1.70	3.52	1.23
1954	2.75	1.69	3.39	1.25
1955	2.64	1.66	2.93	1.18
1956	2.51	1.64	3.17	1.15
1957	2.44	1.62	3.11	1.13
1958	2.40	1.61	3.08	1.06
1959	2.28	1.61	3.01	1.15
1960	2.22	1.60	2.98	1.16
1961	2.17	1.58	2.93	1.15
1962	2.15	1.54	2.83	1.14
1963	2.05	1.52	2.76	1.16
1964	1.99		2.59	1.17

These are all D.B.S. figures.

Figures for 1964 are preliminary estimates.

TABLE NO. 5

Total Number of Customers of Utilities
(thousands)

Year	Alberta	Canada	Saskatchewan	Manitoba
1953	221	3,817	151	221
1954	239	4,002	170	234
1955	267	4,225	185	243
1956	276	4,412	206	254
1957	295	4,597	220	258
1958	316	4,798	230	267
1959	339	5,009	241	282
1960	355	5,178	256	287
1961	368	5,366	265	300
1962	384	5,531	271	304
1963	396	5,647	276	297
1964	* 408		286 (1)	312 (1)
1965	* 423			

Increase during the ten-year period ending 1963

	Alberta	Canada	Saskatchewan	Manitoba
1953-1963 Increase:	175	1,830	125	76
Per cent Increase:	79%	48%	83%	34%

Increase Alberta: 1955 to 1965 = 58%

* 1964 and 1965 figures for Alberta are compiled by the Alberta Power Commission.

(1) 1964 figures for Saskatchewan and Manitoba are preliminary estimates provided by Dominion Bureau of Statistics.

All figures for 1963 and prior years have been taken from D.B.S. publications.

TABLE NO. 6

Number of Farms Served by Utilities

as at December 31 each year

Year	* Alberta	Saskatchewan	Manitoba
1953	24,181	13,850	33,601
1954	30,504	21,287	37,422
1955	34,768	28,993	38,277
1956	37,658	38,495	38,091
1957	41,130	44,955	38,120
1958	45,848	50,813	38,700
1959	49,923	55,424	39,027
1960	53,151	59,384	39,162
1961	55,768	62,260	39,326
1962	58,593	59,684	39,489
1963	61,340	61,084	39,639
1964	63,211	62,436	39,589
1965	64,886		

* Figures for Alberta are Alberta Power Commission figures, and others are from the Dominion Bureau of Statistics. D.B.S. figures for 1964 are preliminary estimates.

TABLE NO. 7

Consumption in K.W.H. Per Farm per Year

Year	Alberta	Canada	Saskatchewan	Manitoba
1953	2,604	2,420	1,915	2,943
1954	2,958	2,672	2,053	3,541
1955	2,882	2,803	2,054	3,564
1956	3,255	3,060	2,217	3,911
1957	3,297	3,415	2,490	4,238
1958	3,566	3,686	2,670	4,586
1959	3,956	4,086	3,180	5,366
1960	4,029	4,345	3,315	5,523
1961	4,404	4,654	3,537	5,995
1962	4,804	5,204	4,198	6,637
1963	4,905	5,985	4,581	7,234
1964	* 5,403		5,059 (1)	7,921 (1)
1965	* 6,096			

* 1964 and 1965 figures for Alberta are compiled by the Alberta Power Commission.

(1) 1964 figures for Saskatchewan and Manitoba are preliminary estimates provided by Dominion Bureau of Statistics.

All figures for 1963 and prior years have been taken from D.B.S. publications.

TABLE NO. 8

TOTAL POLE LINE MILEAGE

(Includes transmission, distribution and rural lines)

Year	Trans-mission	Distri-bution	R.E.A. Lines	Company-owned Rurals	Total Lines
1955	6,003	3,214	24,051	2,965	36,233
1956	7,030	3,486	26,008	2,906	39,430
1957	7,843	4,006	28,618	2,943	43,410
1958	9,105	4,264	32,437	2,915	48,721
1959	9,693	4,679	35,047	2,949	52,368
1960	10,096	5,034	36,661	3,030	54,821
1961	10,677	5,309	38,058	3,069	57,113
1962	11,491	5,807	39,393	3,086	59,777
1963	12,193	5,819	40,570	3,118	61,700
1964	13,152	6,079	41,652	3,100	63,983
1965	13,839	6,346	42,710	3,137	66,032
1955-1965 Increase:	7,836	3,132	18,659	172	29,799
Per cent Increase:	131%	97%	78%	6%	82%

All figures compiled by the Alberta Power Commission.

TABLE NO. 9

K.W.H. GENERATED PER CAPITA IN ALBERTA

Year	Population	KWH Generated x 10^6	KWH Generated/ Capita
1955	1,066,000	1,728	1,621
1956	1,123,000	2,019	1,798
1957	1,160,000	2,243	1,934
1958	1,201,000	2,474	2,060
1959	1,243,000	2,830	2,277
1960	1,283,000	3,126	2,436
1961	1,332,000	3,446	2,587
1962	1,370,000	3,768	2,750
1963	1,405,000	4,186	2,979
1964	1,432,000	4,596	3,209
1965	1,451,000	5,138	3,541

PRESENT STATUS OF THE INDUSTRY

The statistics for the Electric Utilities for the year 1965 follow. Some of the minor figures are estimates only, due to the fact that the report has to be prepared before the various utilities have completed their statistics for the past year. These minor estimates will not be in error by more than 1% or 2%, so that the error in the whole will be negligible.

Tables 10 to 20 deal with plant capacity, peak load and KWH generated. They break up the figures to show what was generated by hydro, steam and internal combustion engines, and also to show the proportions generated by the publicly-owned and the privately-owned plants. Table No. 16 gives further details of the generating plants and their output. Now that the Peace River country is connected to the larger interconnected system by means of a 138 K.V. transmission line, this table has been changed so as to include under Group A all of the larger interconnected system (which now includes the Peace River country), and to put under Group B only those miscellaneous isolated plants such as McMurray, Jasper, and those plants generally north of Manning.

Since it is desirable to have a separate record of the power generated and of the consumption of the Peace River country, this has been accomplished by showing these figures as a sub-total under Group A. Group A, of course, includes the Cities of Edmonton, Calgary, Lethbridge, Red Deer, and Medicine Hat, and the Towns of Ponoka, Fort McLeod and Cardston. Some of these do not generate their own power but purchase it from Calgary Power Limited and retail it to their inhabitants. Group A includes the hydro plants of Calgary Power Limited, which are rated as follows:

In 1965, the interconnected system shown as Group A., had a combined capacity of 1,315,500 KW, and generated 5,114,873,000 KWH. It served 420,591 customers. This system accounts for over 99% of the generating capacity of the province, and of the KWH generated and number of customers served.

The Peace River Country interconnected system shown as a sub-total under Group A had a combined capacity of 33,800 KW, generated 125,974,000 KWH, and served 19,970 customers.

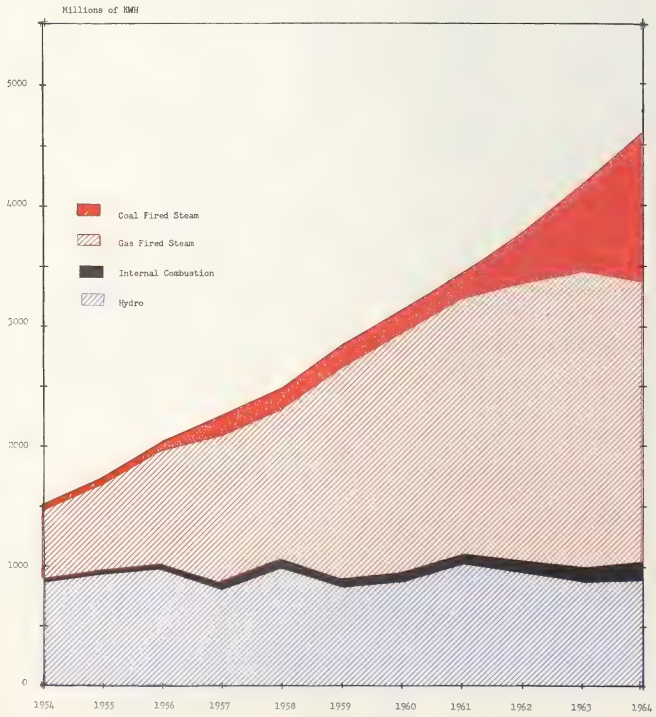


CHART NO. 2 - ELECTRIC ENERGY GENERATED IN ALBERTA
1954 - 1964 BY SOURCES OF ENERGY

TABLE NO. 10

Plant	Capacity	
	Gross H.P.	Net K.W.
Pocaterra	18,500	14,900
Interlakes	6,900	5,000
Rundle	63,000	49,900
Spray	124,000	102,800
Three Sisters	3,600	3,000
Cascade	46,000	35,900
Horseshoe	20,000	13,900
Kananaskis	24,000	18,900
Barrier	16,000	12,900
Ghost	67,450	50,900
Bearspaw	22,000	16,900
Brazeau	200,000	150,000
	611,450	475,000

TABLE NO. 11

The 1965 rating of the major thermal plants is as follows:

	Plant	Fuel	Net K.W. Rating
	Calgary Power Ltd.		
	Wabamun	Gas	68,000
	Wabamun	Coal	215,000
	Canadian Utilities Ltd.		
	Battle River	Coal	66,000
	Drumheller	Coal	17,500
*	Vermilion	Gas	39,000
*	Sturgeon	Gas	18,500
**	Fairview	Gas	11,400
*	City of Edmonton	Gas	320,000
*	City of Lethbridge	Gas	30,700
	City of Medicine Hat	Gas	40,500
	East Kootenay Power Co.	Coal	10,000

* Includes Gas Turbines

** Jointly owned by Canadian Utilities Ltd. and Northland Utilities Ltd.

TABLE NO. 12

The following Companies or Municipalities provide Central Station Electrical Service in the province. This table gives preliminary data as to their plant capacity, their loads, and the KWH they generated (net) in 1965.

PRIVATELY OWNED

Name of Company	Plant Capacity Dec. 31/65 Net K.W.	Peak Load (KW) on plants during 1965	KWH Gen. Net - 1965 (thousands)
Calgary Power Ltd.	758,000	707,000	3,146,913
Canadian Utilities Ltd.	148,825	109,900	543,782
Northland Utilities Ltd.	18,385	17,100	45,521
East Kootenay Power Co.(1)	10,000	10,000	8,482
	935,210		3,744,698

PUBLICLY OWNED

Name of Municipality			
City of Edmonton	320,000	287,000	1,071,292 (2)
City of Lethbridge	30,700	25,000	105,794
City of Medicine Hat	40,500	39,900	215,893 (3)
	391,200		1,392,979
Total	1,326,410		5,137,677

(1) The East Kootenay power plant is located at Sentinel some two or three miles inside the Alberta border. While this energy is generated in Alberta, most of it is exported to British Columbia.

(2) Includes 36,197,000 KWH sold to Calgary Power Ltd.

(3) Includes 81,242,100 KWH sold to Calgary Power Ltd.

TABLE NO. 13

The following is a rearrangement of the figures in Table 12, so as to break them down into power generated by hydro, steam and internal combustion plants. Some of the thermal plants include gas turbines.

Name of Company	Plant Capacity December 31/65 KW (Net)	Peak Load (KW) on plants during 1965	KWH Gen. Net - 1965 (thousands)
HYDRO			
Calgary Power Ltd.	475,000	443,500	1,411,342
Northland Utilities Ltd.	1,400	850	6,519
Total Hydro:	476,400		1,417,861
STEAM			
Calgary Power Ltd.	283,000	284,500	1,735,353
Canadian Utilities Ltd.(5)	122,500	80,950	440,226
East Kootenay Power Co.(3)	10,000	10,000	8,482
City of Edmonton (5)	320,000	287,000	1,071,292 (6)
City of Lethbridge (5)	30,700	25,000	105,794
City of Medicine Hat	40,500	39,900	215,893 (4)
Total Steam:	806,700		3,577,040
INTERNAL COMBUSTION			
Calgary Power Ltd.	-	-	218
Canadian Utilities Ltd. (5)	26,325 (1)	28,950	103,556 (2)
Northland Utilities Ltd.	16,985	16,250	39,002
Total Internal Combustion	43,310		142,776
GRAND TOTAL:	1,326,410		5,137,677

(1) Includes 1,200 KW unit at Fairview
(2) Includes some KWH generated at Fairview
(3) See footnote (1) on Table No. 12
(4) Includes 81,242,100 KWH sold to Calgary Power Ltd.
(5) Includes Gas Turbines
(6) Includes 36,197,000 KWH sold to Calgary Power Ltd.

TABLE NO. 14

The following table may be of interest as showing the relative percentages of capacity and generation as set out in the foregoing tables.

Method of Generation	% of Capacity	% of Power Generated
Hydro	35.9	27.6
Steam & Gas Turbine	60.8	69.6
Internal Combustion	3.3	2.8
	100.0	100.0
Publicly owned	29.5	27.1
Privately owned	70.5	72.9
	100.0	100.0

TABLE NO. 15

The following is a breakdown of the fuel used in larger thermal plants during 1964.

	Gas M.C.F.	Oil Gallons	Coal Tons
Calgary Power Limited			
Wabamun	8,297,021	-	814,144
Canadian Utilities Ltd.			
Drumheller	-	-	52,428
Battle River	-	-	227,807
Vermilion	144,610	693,675	-
Valleyview	1,475,948	-	-
Miscellaneous	4,207	127,723	-
Northland Utilities Ltd.			
Fairview	551,086	259	-
Miscellaneous	102,403	335,999	-
City of Edmonton	11,599,426	4,313,394	-
City of Lethbridge	1,982,309	-	-
City of Medicine Hat	4,037,639	-	-
	28,194,649	5,471,050	1,094,379

TABLE NO. 16

SUMMARY OF GENERATING PLANTS IN ALBERTA

As at December 31, 1965

	Hydro		Steam		Internal Combustion	
	K.W. Rating (Net)	Net K.W.H. Generated 1965 (thousands)	K.W. Rating (Net)	Net K.W.H. Generated 1965 (thousands)	K. W. Rating (Net)	Net K.W.H. Generated 1965 (thousands)
A. WITHIN THE INTERCONNECTED SYSTEM						
Calgary Power Ltd.	475,000	1,411,342	283,000	1,735,353	-	218
Canadian Utilities Ltd. (1)			122,500	440,226		
City of Edmonton (1)			320,000	1,071,292		
City of Lethbridge (1)			30,700	105,794		
City of Medicine Hat			40,500	215,893		
East Kootenay Power Co. Ltd.			10,000	8,482		
Athabasca System (N.U.L. (2)					-	299
Sub-total	475,000	1,411,342	806,700	3,577,040	-	517
Peace River Interconnected System						
Canadian Utilities Ltd. (includes Smith)					23,600	98,016
Northland Utilities Ltd.(excludes Worsley)					10,200	27,958
Peace River Sub-total					33,800	125,974
TOTAL GROUP A INTERCONNECTED SYSTEM	475,000	1,411,342	806,700	3,577,040	33,800	126,491
B. ISOLATED SYSTEMS						
Canadian Utilities Ltd.						
McMurray					2,125	4,664
Miscellaneous Small Plants					550	876
Northland Utilities Ltd.						
Jasper	1,400	6,519			2,570	3,360
Worsley					1,500	3,559
Miscellaneous Small Plants					2,715	3,826
TOTAL GROUP B ISOLATED SYSTEMS	1,400	6,519			9,510	16,285
COMBINED TOTALS	476,400	1,417,861	806,700	3,577,040	43,310	142,776
GRAND TOTALS FOR PROVINCE			1,326,410	5,137,677		

(1) Includes gas turbines

(2) Transferred to Calgary Power Ltd. in 1965.

TABLE NO. 17

Total Circuit Miles of Transmission Lines in the Province by Regional Groups as at December 31, 1965. This does not include Company-owned or Co-operative-owned farm lines.

	VOLTAGE			
	Up to 22,000	33,000 to 72,000	132,000 & greater	Total
A. Within the Interconnected System				
Calgary Power Ltd.	6,317	1,341	1,842	9,500
Canadian Utilities Ltd.	1,376	861	156	2,393
City of Medicine Hat	34			34
East Kootenay Power Co. Ltd.	45	55		100
Sub-total:	7,772	2,257	1,998	12,027
Systems within the Peace River Country				
Canadian Utilities Ltd.	453	370	132	955
Northland Utilities Ltd.	572	149	-	721
Peace River Sub-total:	1,025	519	132	1,676
Total Group A - Interconnected System	8,797	2,776	2,130	13,703
B. Isolated Towns				
Canadian Utilities Ltd.				
McMurray	8			8
Northland Utilities Ltd.				
Jasper	37			37
Worsley	1			1
Other Areas	90			90
Total Group B - Isolated Systems	136			136
COMBINED TOTALS:	8,933	2,776	2,130	13,839

This table has been revised this year to eliminate company-owned farm lines previously included in the category "Up to 22,000".

TABLE NO. 18

SUMMARY OF DISTRIBUTION SYSTEMS IN ALBERTA

As at December 31, 1965

	Total Number of Customers Served (Includes Rurals)	K.W.H. Sold (Less Sales to other Cos.) (thousands) (Includes Rurals	Circuit Miles of Line (Excludes Rurals)
A. Within the Interconnected System			
Calgary Power Ltd.	134,800	1,760,000	2,237
* Canadian Utilities Ltd.	38,040	292,512	708
** East Kootenay Power Co. Ltd.	1,285	18,601	35
City of Edmonton	94,191	915,840	890
City of Calgary	100,075	1,036,072	1,110
City of Lethbridge	12,177	97,843	142
City of Medicine Hat	9,262	134,650	112
City of Red Deer	7,184	60,138	143
Town of Cardston	1,040 (est.)	4,300 (est.)	34 (est.)
Town of Fort Macleod	990 (est.)	4,650 (est.)	21 (est.)
Town of Ponoka	1,577	9,507	26
Sub-total	400,621	4,334,093	5,458
Systems within the Peace River			
Canadian Utilities Ltd. (Includes Smith)	10,927	98,990	568
Northland Utilities Ltd. (Excludes Worsley)	9,043	43,111	226
Peace River Sub-total	19,970	142,101	794
TOTAL GROUP A INTERCONNECTED SYSTEM	420,591	4,476,194	6,252
B. Isolated Towns			
Northland Utilities Ltd.			
Jasper	805	7,772	30
Worsley	67	2,436	1
Miscellaneous Small Plants	463	3,299	29
Canadian Utilities Ltd.			
McMurray	675	4,147	14
Miscellaneous Small Plants	164	792	20
TOTAL GROUP B ISOLATED SYSTEMS	2,174	18,446	94
COMBINED TOTALS	422,765	4,494,640	6,346

* Reduction due to change in classification of customers.

** Includes Towns of Coleman, Frank, Cowley, etc.

SUMMARY OF RURAL ELECTRIFICATION SYSTEMS IN ALBERTA

As at December 31, 1965

	Number Farms Served	Number Non-Farmers Served	Total Number Customers	Circuit Miles of Line
A. WITHIN THE INTERCONNECTED SYSTEM				
Calgary Power Ltd.				
Experimental Areas and Individual Rurals*	4,378	1,194	5,572	2,495
R.E.A.'s	40,734	7,558	48,292	27,120
Canadian Utilities Ltd.				
Experimental Areas and Individual Rurals*	761	110	871	453
R.E.A.'s	12,560	1,029	13,589	10,687
East Kootenay Power Co. Ltd.				
R.E.A.'s and Lundbreck Co-op.	174	63	237	162
Adjacent to Cities, etc.*	180	-	180	68
Sub-total	58,787	9,954	68,751	40,985
Peace River Interconnected System				
Canadian Utilities Ltd.				
Experimental Areas and Individual Rurals*	124	99	223	96
R.E.A.'s	3,087	172	3,259	2,458
Northland Utilities Ltd.				
Experimental Areas and Individual Rurals*	129	-	129	24
R.E.A.'s	2,650	220	2,870	2,172
Peace River Sub-total	5,990	491	6,481	4,750
TOTAL GROUP A INTERCONNECTED SYSTEM	64,777	10,445	75,232	45,735
B. ISOLATED AREAS SERVED BY NORTHLAND UTILITIES LTD.				
Company-owned Rurals*	1	-	1	1
R.E.A.'s	108	16	124	111
TOTAL GROUP B ISOLATED SYSTEMS	109	16	125	112
COMBINED TOTALS	64,886	10,461	75,347	45,847

* The lines to serve these farms are the property of the Power Companies.

TABLE NO. 20

DATA RE CENTRAL STATIONS IN ALBERTA BY REGIONAL GROUPS

As at December 31, 1965

	GROUP A INTERCONNECTED SYSTEM			GROUP B ISOLATED SYSTEM	COMBINED TOTALS
	South Area	Peace River Area	Sub-total		
Plants					
K.W. Rating	1,281,700	33,800	1,315,500	9,510	1,326,410
K.W.H. Generated (Thousands)	4,988,899	125,974	5,114,873	22,804	5,137,677
Transmission					
Miles of Line (1)	12,027	1,676	13,703	136	13,839
Distribution					
Number of Customers	400,621	19,970	420,591	2,174	422,765
K.W.H. sold (Thousands)	4,334,093	142,101	4,476,194	18,446	4,494,640
Miles of Line	5,458	794	6,252	94	6,346
Rural					
Number of farms (2)	58,787	5,990	64,777	109	64,886
Number of non-farms (2)	9,954	491	10,445	16	10,461
Miles of company owned farm line(3)	3,016	120	3,136	1	3,137
Miles of R.E.A. line (3)	37,969	4,630	42,599	111	42,710
Total farm lines (3)	40,985	4,750	45,735	112	45,847

(1) See footnote to Table No. 17.
(2) Included in Number of Customers shown under Distribution.
(3) Not included in Miles of Line shown under Distribution or Transmission lines.

BIG BEND HYDRO PLANT

The following is a more detailed summary of the changes to generating capacity, transmission line facilities, etc., during the year 1965:

CALGARY POWER LIMITED

(1) Plant Capacity

The first unit at the Big Bend Plant, which is the power development section of the Brazeau Storage and Power Development, was placed in operation in April, 1965. This Power Development Section consists of outlet works from the reservoir, a power canal, intake works, penstock and a powerhouse with an initial unit of 150,000 kilowatts.

Work is continuing on the extension to the Big Bend Development which will add a second unit of 190,000 kilowatts capacity to the plant for operation in the fall of 1966.

Construction is also continuing on an extension to the Wabamun Plant which will add a 300,000 K.W. coal burning unit for operation in the fall of 1967.

(2) Transmission Lines

Hughenden	138 KV	20 miles operates at 22 KV.
Sunshine Village	13 KV	10 miles
Okotoks - Black Diamond	69 KV	10.7 "
Edson - Cadomin	22 KV	56 "
Hinton	69 KV	4 "
Clearwater	22 KV	9 "
Golden Spike	22 KV	8.7 "
Chisholm	23 KV	25 "
Black Diamond	22 KV	3 "

(2) Transmission Lines (cont'd)

Fort Saskatchewan	138 KV	27	miles
Innisfail	138 KV	0.4	"
	22 KV	4.0	"
Chisholm	22 KV	3	"
Lodgepole	138 KV	19	"
	23 KV	3	"

(3) Substations

New Substations

Sherritt Gordon - Ft. Saskatchewan	Construct 138 KV substation 2 - 12 MVA transformers and switching.
Premier Steel - Edmonton	Construct 25 MVA 138/13.8 KV substation.
Hinton	Construct 5 MVA 69/23.9 KV Substation.
Keystone	Construct 6 MVA 69/23.9 KV Substation.
Spruce Grove	Construct 6 MVA 69/23.9 KV Substation.
Innisfail	Construct 12 MVA 138/23.9 KV Substation.
Harmattan	Construct 7.5 MVA 138/23.9 KV Substation.
Black Diamond	Construct 2.5 MVA 69/23.9 KV Substation.
Okotoks	Install 3 automatic sectionalizing airbreaks.
Judy Creek	Construct 6000 KVA 69/23.9 KV Substation.
Cremona	Construct 138 KV switching structure.

Extensions to Main Substations.

Lodgepole	Add 30 MVA 138/69 KV Auto transformer and switching.
Benalto	Add 30 MVA 240/69 KV Auto transformer and switching.
Fort Saskatchewan	Add 138 KV Switching structure, 138 KV Breaker and 50 MVA 138/69 KV auto transformer.

(3) Substations

Extensions to Main Substations (cont'd)

East Edmonton Sub.	Install 138 KV oil circuit breaker - 3 - 8333 KVA 138/23.9 KV transformer. 1 - 23.9 KV breaker.
Empress Sub.	Install 23.9 KV oil circuit breaker.
Calder	Install 20 MVA 23.9 KV voltage regulator.
Drayton Valley	Install 1 - 69 KV oil circuit breaker.
Edson	Add 69 KV switching structure and breakers.
Lethbridge	Install 23.9 KV breaker.
Pincher Creek	Install 23.9 KV breaker.
Holden	Increase transformer capacity to 6000 KVA.
Rocky Mountain House	Install 6000 KVA 69/23.9 KV transformer and additional switching.

(4) Service

Communities

Robb

Chisholm

Brule

Cadomin

Brownlow's Landing (Gull Lake)

Weslake Beach (Hastings Lake)

McLaurin Beach (Gull Lake)

Claresholm Airport Area

Street Lights

Approximately 1,234 new Mercury Vapor street lights will have been added to Calgary Power's system during 1965 and 541 incandescent fixtures removed.

(4) Service (cont'd)

Oilfields

Main activity this year continued to be Pembina and Keystone Fields and extensions were made to the Taber Field for 113 pumping services. A total of 765 new oilfield services were added, representing 9,340 HP (well pumps, gathering systems, water systems and miscellaneous), but disconnected 798 oilfield services representing 8,995 HP which were no longer required. There are now a total of 7,250 oilfield services - 4,650 oilwell pumps, 1,050 for gathering systems, 575 for water pumping and injection systems and 975 miscellaneous services.

The power being supplied to Gas Plants increased by over 3,000 HP again this year. There was a considerable increase in the oil pipeline pumping load and indications are that this load growth will accelerate. The load at Sherritt Gordon Mines at Fort Saskatchewan increased by 8,500 KW and a further increase here is anticipated.

Calgary Power's two year old program of electric power for irrigation pumping achieved significant results this year with some 1,800 HP connected. Service was supplied to an increasing number of agro-industries and small manufacturing concerns whose products range from cleaned and packaged potatoes to drill-pipe to plastic shot-gun shells.

CANADIAN UTILITES, LIMITED

(1) Plant Capacity

Boiler and Turbine contracts have been awarded for the installation of a 150,000 KW coal-fired steam-generator at the Company's

Battle River plant. Commissioning date for this unit is set for June, 1969. This installation will replace the previously planned 75,000 KW unit.

A 20,000 KW gas turbine unit will be installed in Simonette with a commissioning date set for October 1, 1966. This plant will be able to be operated from the Sturgeon station by remote control. As a result of this decision, plans to move the 30,000 KW gas turbine from Vermilion into the Worsley area in 1967 have been cancelled.

A mobile 500 KW Caterpillar generating unit capable of providing emergency service to a town of up to 1500 people was designed during the year. The unit will be primarily for storm emergencies, line rebuilds and for backing up isolated northern plants in case of generator breakdowns. A second mobile unit is planned for 1966.

Plant capacity at Fort McMurray was increased by 500 KW to 2,175 KW.

The Fort Chipewyan plant was increased by 75 KW during 1965, bringing the total installed capacity to 375 KW.

(2) Transmission Lines

During the year Canadian Utilities, Limited built the following lines:

70 miles of 138 KV line from the Sturgeon Plant to Grande Prairie

24 miles of 72 KV line from Sarah Lake to Swan River

62 miles of 72 KV line tying in the Mitsue Oilfield to Swan River

18 miles of 72 KV from Stettler to Nevis

Converted 40 miles of line from Lloydminster to Vermilion from 36 KV to 72 KV.

(3) Substations

Three major transmission substations were built during 1965 at Nevis, Swan River and Mitsue oilfield. A 6000 KVA, 72/25 KV transformer was installed in each substation.

(4) Service

During 1965, Canadian Utilities, Limited provided service to over 100 new oilfield customers mainly in the Swan Hills area.

Two oil pumping loads totalling 600 H.P. were added at Pollockville and Throne during 1965.

NORTHLAND UTILITIES LIMITED

(1) Plant Capacity

The Paddle Prairie plant and the Battle River Micro-wave plant, totalling 53 KW, were dismantled during the year following the completion of a transmission line from the Peace River system. Fort Vermilion plant, totalling 475 KW, and La Crete, with 50 KW, were dismantled on the completion of a transmission line from High Level. The Athabasca plant, with capacity of 1800 KW, was sold to Calgary Power Ltd. At High Level a 500 KW unit was added, bringing the plant capacity up to 1850 KW. The Overlander plant capacity is 150 KW now with the addition of a 100 KW unit. Wabasca plant added two 100 KW units and retired two 75 KW units, making the net total plant capacity 275 KW. Meander River added two 25 KW units and retired a 10 KW unit, leaving the plant capacity at 50 KW. Watt Mountain retired a 10 KW unit and added a 20 KW unit.

The Company's Athabasca and Lac La Biche systems were sold in September to Calgary Power as it was felt these particular properties formed a more natural part of the Calgary Power system than they did of

the Northland Utilities Limited system. Similarly the operation of the various R.E.A.L. systems connected to Northland Utilities Limited system in these areas were turned over to Calgary Power Ltd.

(2) Transmission Lines

During the year the following lines were built:

50 miles of 25 KV from High Level to Fort Vermilion which tied the two towns together and allowed the removal of the Fort Vermilion plant.

25 miles of 25 KV from Peace River to Wesley Creek to serve an oilfield type load.

8 miles of 25 KV to serve a Forestry development at Footner Lake, which is north of High Level.

4 miles of 25 KV to serve the new Peace River Gaol.

13 miles of single phase 14.4 KV was built to serve the hamlets of Meander River and Indian Cabins in Northern Alberta.

8 miles of 25 KV was built in the Hay Lakes Reserve to service another Indian Reserve.

CITY OF EDMONTON

(1) Plant Capacity

The City is installing a 72,000 KW steam turbine which will be commissioned in 1966.

GENERAL OUTLOOK

As will be seen, a great deal of substation and transmission capacity has been added again this year to keep pace with the remarkable growth of load. A noticeable part of this added capacity was constructed

to serve the new Sylvia-Mitsue field. Its need for power both in the oilfield and for the pipeline has changed the electrical complexion in the area between Athabasca and Lesser Slave Lake. Amongst other power lines Canadian Utilities Ltd. has built a 72 KV line connecting the Swan Hills field with the Sylvia-Mitsue field. Calgary Power Ltd. has strengthened its feeder lines north from Clyde. Eventually, we may expect an interconnection to be made in the vicinity of Smith and this may form another source of power for the southeastern section of the Peace River country.

Year by year such transmission and interconnecting lines are built but, while they are equally as important as power plants, they do not catch the attention of the public. During the past ten years many miles of such grid facilities have been built.

The growth of the electric utility industry since 1955 presents a most interesting picture. This growth, of course, is what might have been expected in a rapidly developing province where the population jumped from 1,066,000 in 1955 to 1,451,000 in 1965. During this decade the capacity of power plants rose from 477,000 K.W. to 1,326,000 K.W. (178%) while the KWH generated increased from 1,707,000,000 to 5,137,677,000 (201%). During this interval the number of customers increased by 58% from 267,000 to 423,000, while the number of farms served rose from 34,768 to 64,886. The miles of power line rose from 36,233 to 66,032. At the same time, keeping pace with the growing wealth of the province and its growing industrialization, the KWH generated per capita rose from 1,621 KWH to 3,541. That is, it more than doubled. Similarly, the KWH used per farm increased from 2,882 to 6,096 per year.

A brief look at the actual power plants and transmission lines

that have come into service during the period presents a picture of an industry growing with the province, and, by means of an interconnected grid of transmission lines, reaching out to all its remote corners. In 1955, on the Kananaskis River, the Pocaterra and Interlakes plants added 20,000 KW to the generating capacity. Other additional Calgary Power hydro units were Cascade, 18,000 KW, Rundle, 30,000 KW, Spray, 50,000 KW, and finally in 1965, the first unit of 150,000 KW was installed on the Brazeau River.

Side by side with these has come a rather spectacular increase in thermal plants. The large City of Edmonton power plant increased its capacity by 234,000 KW, that is, during the last ten years it doubled in capacity and then nearly doubled again. During that interval when gas turbines, a relatively new development in prime movers, were to some extent in the experimental stage, the City installed two of these machines which were rated at 30,000 KW each. When the first one went in, it was the largest gas turbine generating unit in the world. As well as these gas turbines, however, the City installed one 30,000 KW steam turbine and followed it by two 72,000 KW machines. Rapid strides were being made in developing larger steam turbines and both the City of Edmonton and the power companies took advantage of these developments.

During the decade, Canadian Utilities Ltd. commenced utilizing coal from the Battle River strip mine and to date has installed two turbines of 33,000 KW each, while Lethbridge installed a 10,000 KW gas turbine.

In 1956, Calgary Power Ltd. started its Wabamun coal-fired plant on a strip mine capable of producing extremely low cost coal. Into this plant went two 72,000 KW machines and one rated at 150,000 KW. The

second of Alberta's large strip mine projects was underway utilizing the latest large size turbines.

In total, starting from a power plant capacity of 477,000 KW at the beginning of the period, 849,000 KW were added, an increase of 178%. Perhaps more significant than that however has been the rapid step up to large size modern thermal units during this decade. These larger size units, bringing with them the benefit of scale, have been a major factor in keeping the cost of power down.

At the beginning of this ten-year period, in addition to the major interconnected plants listed above, there were some fifteen separate systems of isolated towns served by plants that were not tied into the main system. During the past ten years, all of these, except Jasper and Ft. McMurray, have been tied together and many small inefficient plants have been shut down.

Equal in drama to the building of large steam and hydro plants has been the construction of the network of major transmission lines that now form the Alberta grid. This ties the electrical facilities of the province together from the Cypress Hills in the southeast corner to Paddle Prairie in Township 103, Range 22 W 5. Paddle Prairie, the most northwesterly point, is approximately 300 miles west and 600 miles north of the extreme southeast point in the system.

While the first lines interconnecting the various cities and power companies were built in the early 1930's, and other similar lines including one to British Columbia were added from time to time, the last ten years have seen the major strides in this direction. During this period some 1,200 miles of 69 KV lines have been built as well as approximately the same mileage of 132 KV or higher lines. Now there are double

the mileage of 69 KV lines that there were ten years ago and two and one-half times as many miles of 132 KV or higher voltage lines.

Whereas, at the beginning of the period, the 132 KV or higher lines generally emanated from Calgary Power Company's Bow River plants and ran north to Edmonton, east to Medicine Hat and southward to connect with British Columbia in the Crow's Nest Pass, now they connect the major power centres of the province. One set of these lines, including interconnecting loops runs from Calgary to Medicine Hat and back by way of Lethbridge and Ft. McLeod to Calgary. Another set runs east of Edmonton to Vermilion and thence south to Canadian Utilities Ltd. Battle River plant. This ring will soon be completed back to Red Deer. Other lines now connect Edmonton and the Wabamun plant and continue west to Hinton. A new line now runs south from Wabamun to a junction point west of Red Deer where it picks up a line from the Brazeau plant and then goes south to Calgary. Finally, a 132 KV line now connects Canadian Utilities' Valleyview plant with the Wabamun plant, that is, it interconnects the Peace Rivery system with the rest of the province.

While all these 132 KV lines have been built, an equal mileage of 69 KV lines have been run here and there in the province. For one thing, the Swan Hills and associated oilfields entered the picture culminating recently in the Slave Lake-Mitsue field. Power for these areas is supplied off the main grid and interconnections of lesser magnitude now link up this field including one which joins Calgary Power Company's lines in the vicinity of Chisholm with Canadian Utilities lines which run along Lesser Slave Lake and that river. Of particular significance has been the construction of 69 KV lines in the Peace River country until now a ring of these lines makes a complete circle starting from Valleyview

This mobile generating unit, capable of providing emergency electric service for a town of 1,200 to 1,500 people, was put into service by Canadian Utilities in the fall of 1965. Its uses will include the provision of on-site power generation for emergencies such as storms which may cause major system breakdowns; temporary power during rebuilding of lines and sub-stations, and service to rural areas during major line changes. It is particularly suitable for backing up isolated northern plants in case of generator breakdowns.

and running through Grande Prairie, Fairview, Peace River and back to Valleyview. Lines of lesser voltage have been run north from Grimshaw and now reach as far as Paddle Prairie.

While such significant strides were being made and while all but two of the isolated plants of 1955 vintage have been replaced by transmitted power, other isolated plants appeared in the north of the province. A list of these, by no means complete, includes Chipewyan, Worsley, Red Earth, Wabasca, Atikameg, Simonette, High Level and Hay Lakes. The development of the Rainbow Lake oil and gas field is now bringing with it the necessity for power and steps are underway to supply it. The face of Alberta's north is changing and will continue to change as power lines are built to connect these isolated places.

At the present time, the total demand for power in the Peace River country is of the order of 40,000 KW. While the population of the area is nearly 6% of that of all of Alberta, it uses less than 3% of the power used in the province. This load is supplied by internal combustion units and by gas turbines at Valleyview, Fairview, and Worsley, which use natural gas as fuel, and by the new 138 KV Wabamun-Valleyview transmission line.

It is difficult to predict how rapidly industry and thus population and therefore electrical load will grow in the area. At whatever rate it grows, supplying it will not present any particular problem. Thermal power can be generated anywhere that a fuel supply in the form of oil, gas, or coal is available. Oil is an expensive fuel and so far coal suitable for thermal plants has not been discovered in the Peace River country. During 1966, however, the Alberta Research Council is planning a preliminary study of the area within a radius of some sixty miles south of Grande Prairie.

Except for the vicinity of Worsley, new discoveries of natural gas in the areas have not been encouraging. During 1966 Canadian Utilities Ltd., however, are planning to install a 20 MW gas turbine in the Simonette oilfield and to feed surplus power out east to the main transmission line running along the Whitecourt-Valleyview highway. For the next few years or until some major industries develop in the Peace River country, it is likely that its power requirements will be supplied by installing additional gas turbines combined with importing power from the central part of the province.

It is possible that some power could be imported into the Alberta Peace River country from the Portage Mountain development at Hudson Hope. This power should become available in 1968 and use will be made of it providing that, for the relatively small quantity demanded by the load in that region, its delivered cost is less than that from other sources. The unit cost of transmitting this small amount of power will be high, so that it will probably have little effect in reducing the cost of power in that area. There has been some discussion about building an E.H.V. line to send power into the Edmonton area from Hudson Hope, but it is doubtful if this would be economical.

There are several power sites on the Smoky River and one or two on the Alberta portion of the Peace River. Canadian Utilities Ltd. have made some studies of the Smoky River and the capacity of power sites along it range from a low of 60 M.W. at the junction of the Kakwa and Smoky Rivers to 620 M.W. at Mile 283 from Mt. Robson. The maximum potential of the Smoky River could be about 1,000 M.W. In general, although this river suffers from geological formations which slump, it might be developed before the Peace. In the event of the establishment of a large industry

such as the processing of the iron ore at Worsley, it might be possible to build the first hydro plant on the Smoky River, but even then it is likely that to make it economical much of the surplus power would have to be transmitted south to the rest of the province.

The Peace River, from recent studies made by the Alberta Power Commission, the Water Resources Branch, and the power companies presents some fair possibilities. The most interesting section of the river is that from the B.C. border to the Dunvegan bridge, in which it falls 110 feet. The lower valley banks in this stretch appear to be in a geological formation which will probably support a dam. While the Power Commission's preliminary study of the Peace River has already produced some information, the first stage of the study is not yet finished.

The building of dams and the creation of reservoirs of the magnitude needed to develop the Smoky and the Peace Rivers however must await the need for large blocks of power--blocks which are much greater than can be forecast for several years to come. When that time comes, it will be possible to generate a tremendous amount of power which could be sold very cheaply, providing a market existed for it, but generally speaking if such dams were attempted today, when there is a market for only a limited amount of power, the cost per KWH would be exorbitant.

Recently considerable attention has been focused on large river diversion schemes affecting all our streams which rise in the mountains, and these studies are very timely. While under our existing Water Resources legislation the use of water for generating power ranks fifth in the list of priorities (and quite rightly so)--being outranked by domestic, municipal, industrial and irrigation purposes--nevertheless

it will be necessary to examine these water diversions very carefully to ensure that power generation is one of the factors being taken into account in any particular case.

Now that the tremendous source of energy of the Athabasca oil sands is on the threshold of development, the possibility of generating electric power from liquid coke may be opened up. The combination of fuel such as this with the possible 2,000,000 H.P. of hydro capacity, which is available on the Athabasca River from the vicinity of Athabasca Town to McMurray, make this region of the province most interesting as a source of power. The Ft. McMurray region could also become a large power consuming area and we might expect secondary industries to develop there. At the moment, the only significant increase in load has been in the Town of Ft. McMurray where Canadian Utilities Ltd. have had to make several additions to their internal combustion plant. Power-wise, that area of the province will be worth watching.

Fortunately, Alberta is richly endowed with energy resources from which we can produce cheap power. But for the very reason that we have these resources whose low costs per B.T.U. are all infinitesimally close to each other, it becomes most difficult to predict which of them will be used for future power generation. The generating capacity in the interconnected system, as at the end of the year, was just over 1300 M.W. Our power load now is of such a size that we can begin to think in terms of units of 300 M.W. Such units, if they are thermal, make it possible to open up a large scale mine and to operate it at a high load factor, and hence to produce coal for power generation at a low cost per ton and a very low cost per million B.T.U.'s.

The benefits of scale, however, have also enabled us to raise

our sights with respect to hydro plants and now we can begin to consider some hydro sites which a few years back were too large to contemplate. And so we go on.

Our program of installing future generating equipment envisages coal-fired and gas-fired steam plants, base load hydro plants, with here and there a peak load hydro plant thrown in. At any one time perhaps half a dozen installations are under consideration. Then, as the deadline approaches when we must actually start building a new plant, one is chosen--the one of possibly six which at the moment appears to be infinitesimally less costly in mills per KWH. Having these multiple choices between many competing power sources, all of which are very close in cost, makes it difficult to predict what we will do, in say, ten years from now.

However, there are certain clear-cut guide lines. First of all, natural gas, while used extensively in present plants, cannot, except by a combinations of rare circumstances, compete in cost per B.T.U. with large scale strip-mined coal. Moreover, natural gas has certain properties which make it rather a shame to burn up in big steam furnaces. Secondly, many of our rivers, unlike these in Manitoba, Ontario, Quebec and B.C., do not lend themselves to producing power 24 hours a day and 365 days in the year. To be used as base load plants they require the creation of expensive reservoirs. Thirdly, for many years nuclear power, although making great strides in the East and in the United States will be too expensive to compete with our fossil fuels. Nuclear power, however, will bear watching because as atomic plants get larger and larger the cost per million B.T.U.'s naturally decreases. In perhaps twenty years in Alberta it may well be that nuclear power will set the upper limit of what can be

paid per million B.T.U.'s for coal for power generation.

So at the moment our practical future choices are limited to coal-fired thermal plants and hydro installations. For some time in the future, coal for thermal power plants will be strip-mined. At the moment the Wabamun plant, during a full year's operation, uses something of the order of 1,000,000 tons of coal. Alberta's 1965 output of coal for all purposes was around 3,400,000 tons. As new coal-fired plants are built, the output of coal will increase by leaps and bounds.

Such power plants require major coal fields to provide for their needs for thirty or forty years. An ideal field must have at least 100 million tons of coal which has an overburden of not more than 100 feet, and it must be located close to a large supply of cooling water. Only a relatively few areas have coal deposits which make them ideal for power generation requirements; we can count the number of such fields on the fingers. It appears likely that the next three major coal fields to be developed as power plant sites will be South Wabamun, Sheerness and Genesee. After they get committed for thermal generation, it will be necessary to consider other coal fields such as Ardley or to give some thought to going to some deep seam operation which will not only produce higher B.T.U. coal, but when operated at a high load factor might come up with a surprisingly low cost per million B.T.U.'s.

To supply Alberta's load during the 30-year period from 1970 to 1999, we expect to add thermal plants totalling some 9,800 M.W. In addition to this, of course, there will be many M.W. installed in the existing or new hydro plants but, while it is possible that some hydro plants may be built for base load operation, this added capacity will be used mainly for peaking purposes. Naturally, the picture even twenty

years from now is pretty hazy, but some rather careful thinking has gone into our forecast. In any event, this forecast does give an idea of the magnitude of the amounts of coal we may need for Alberta's requirements.

Normally we would expect to build a power plant on one of these seams of coal and then to install generators up to the limit of the capacity of that coal mine before moving on to another site on another mine. Other factors such as geography, etc. come into this picture and it is quite possible that a second power plant on a second mine would be started before all of the generating capacity is put into a previous plant. Normally, also, one would expect to develop the mine with the least costly coal first and then to move on to the mine with the next lowest cost coal. This, too, will not always be the case because of geographical considerations.

Somewhere after 1990 when loads are large enough to enable a large nuclear plant to operate at a high load factor, such a plant may then be competitive with the higher cost strip coals which are still not committed for base load generation. But even after having installed the first nuclear plant, it would probably be advisable to build more coal fired plants before building a second nuclear station.

We are still looking for large seams of coal that could provide large quantities of cheap power. Furthermore, much work still remains to be done in studying the seams of which we already know. Undoubtedly, these studies will change the picture we see now and will change the order in which these mines will be opened up for power purposes, but they are not likely to change the quantities of coal needed. Inherent to this problem, of course, are the uncertainties in our estimates together with lack of detailed knowledge of our coal resources. Changes either in our

estimates or brought about by increased studies of our coal resources could affect the final answers.

Any estimates we make now may be altered when the Trans-Canada Grid study is completed. The Power Commission is represented on the Grid National Working Committee but it is still too early to determine whether or not such a grid is feasible.

FORECAST TO 1970

Table 21 shows the growth which we believe will take place on the electrical load of the province from now until 1970. It shows the actual capacity in M.W. of the power plants as at December 31, 1964, the increase in capacity during 1965, the peak load that occurred in 1965 and the minimum capacity required. In a large power system it is always necessary to have reserve capacity in case one or more units fail. Current practice on the continent is to maintain a reserve of whatever is the greater of: (1) 12% of the estimated peak load, or (2) the largest unit.

On that basis, we have shown a column which we have called Minimum Capacity Required. Since in 1967, for instance, the largest unit in the province will be a 300 M.W. machine at Wabamun, the minimum capacity required has to be so large that if this unit went out of service we would still have a capacity equal to or greater than 1,350 M.W., which of course is the estimated peak load. As will be seen from the table, we expect to have a capacity of 1897 that year so that if the 300 M.W. machine failed, we would still have 1,597 M.W. of capacity to carry a peak load of 1,350 M.W.

Table 21 indicates that by the end of 1970 our power plant capacity will almost double from 1,315 M.W. as at the end of 1965 to 2,262 M.W.--five years later. Except for one hydro unit, all this increased capacity will be thermal.

Making a detailed forecast for the further five years to 1975 is a little venturesome, but by the end of that year, as we see it at the moment, we will need a power plant capacity of about 3,200 M.W. This increased capacity will most likely be obtained by adding the equivalent of three more 300 M.W. thermal units and will involve starting on another large strip mine and possibly a second. Since these plans are always flexible, a major hydro plant may be substituted for some of this thermal power. In any event, we would expect our power generating capacity in 1975 to be two and one-half times of what it is now.

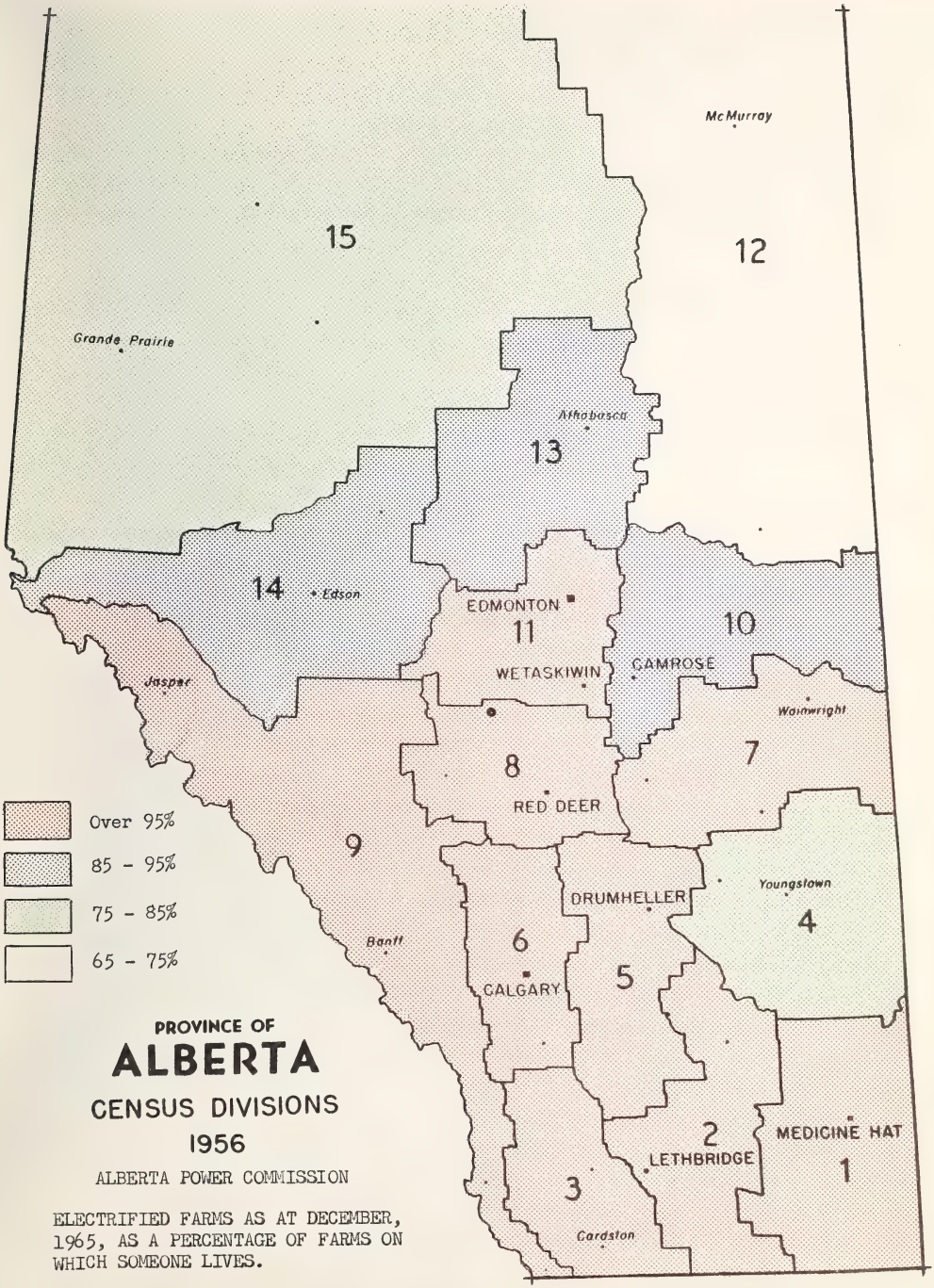
To distribute this power over the province will take a proportionate increase in investment in transmission lines of all sizes. The major lines of 132 K.V. or higher voltages forecast for the period to 1975 are shown diagrammatically on one of the adjoining maps. One of these maps shows the main transmission lines in Alberta as of 1955; the other shows in black the lines as they are in 1965, while the red lines on it show the future main lines.

TABLE NO. 21

FORECAST OF NET GENERATING CAPACITY IN M.W. WITHIN THE INTERCONNECTED SYSTEM

	Capacity added during Year	Capacity at End of Year	Estimated Peak Load	Minimum Capacity Required *
Capacity as at December 31, 1964		1,162	1,000	1,150
Capacity added during 1965				
Calgary Power Co. - Brazeau	150			
Total December 31, 1965	150	1,315	1,096	1,280
Capacity to be added 1966				
City of Edmonton	72			
Calgary Power - Brazeau	190			
Canadian Utilities - Simonette	20			
Total December 31, 1966	282	1,597	1,200	1,390
Capacity to be added 1967				
Calgary Power Co. - Wabamun	300			
Total, December 31, 1967	300	1,897	1,350	1,650
Capacity to be added 1968				
Canadian Utilities - Peace River	50			
Total, December 31, 1968	50	1,947	1,475	1,775
Capacity to be added 1969				
Canadian Utilities - Battle River	150			
Total December 31, 1969	150	2,097	1,580	1,880
Capacity to be added 1970				
City of Edmonton	165			
Total December 31, 1970	165	2,262	1,725	2,025

* Estimated Peak Load plus the greater of 12% or the largest Unit.


McMurray
15
12
Grande Prairie
Athabasca
13
14
Edson
EDMONTON
11
10
WETASKIWIN
CAMROSE
Jasper
Wainwright
8
7
RED DEER
9
DRUMHELLER
Youngstown
4
Banff
6
5
CALGARY
2
MEDICINE HAT
LETHBRIDGE
1
3
Cardston
Over 95%
85 - 95%
75 - 85%
65 - 75%
PROVINCE OF
ALBERTA
CENSUS DIVISIONS
1956
ALBERTA POWER COMMISSION
ELECTRIFIED FARMS AS AT DECEMBER, 1965, AS A PERCENTAGE OF FARMS ON WHICH SOMEONE LIVES.

FARM ELECTRIFICATION

At the end of December, 1965, 64,886 farms had been electrified and during the year 1,675 more were connected. We are now near the end of the construction phase of farm electrification so that the number of farms being hooked up in future years will fall off markedly. According to the 1961 census Albertans operated 73,212 farms but only lived on 65,816 of them. Since that year, the number of farms on which someone lives has decreased until we estimate that now there are not more than 62,500 in that category.

If there are only that many farms on which someone lives, one might well ask, how is it that a total of 64,886 have been hooked up to date when it is obvious that in some parts of the province there are still some farmers who have not yet taken service. There are two or three parts to the answer.

For one thing, some 1,400 Indians are served while the census only counted 576 Indian farms. For another, there are about 3,000 unused services where the land has been consolidated with other farms but where the farmer in question prefers to see the service left on that land. In other cases, there are a number of pseudo-farmers who have moved out from the cities but which the R.E.A.'s class as farmers.

As shown by the map which follows, the saturation of farm electrification is over 95% throughout most of the province and is increasing year by year in those census divisions which are not yet up to that figure. It is lowest in Census Division 12 but that area contains many marginal farms.

Table No. 22 shows the number of farms connected as at December

31, 1965. It also shows the number of non-farm customers served off farm lines.

While there are 64,886 farms connected, farm electrification also served 10,461 non-farm customers who would not have obtained service otherwise. The total number benefiting by the construction of these farm electrification lines is, therefore, 75,347.

As at the end of December, 1965, there were 45,847 miles of farm lines and, during the year, 1,095 miles had been constructed.

Financing

At the end of December there were a total of 376 active Rural Electrification Associations. These Associations have borrowed under the Guarantee Act, the Revolving Fund Act and the Long Term Financing Act, and the total of all of these borrowings for new construction has been approximately $50,443,000. At December 31, 1965, over $32,007,000 of this had been paid back. The investment in all rural lines in the province is slightly over $57,000,000.

By the end of 1965, the Power Commission had given approval to 4,566 applications for loans under Part I of the Revolving Fund Act or under the Long Term Financing Act. While all of this money had not been borrowed by the end of December, the approvals covered 41,898 farms at an estimated cost of $48,920,000.

During 1965, the Power Commission gave approval to applications for loans under Part I of the Revolving Fund Act or under the Long Term Financing Act for an amount of $1,636,123 to give service to 1,255 farms. Of this amount, $1,556,258 was approved where no Part II loan was necessary.

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TABLE NO. 22

Combined figures for Alberta

Farm Electrification as at December 31, 1965.

	No. Farms Connected	Non-Farms	Hamlet Customers	Total Non-Farm Customers	Total Served Off Farm Lines
Experimental Areas	3,466	817	586	1,403	4,869
Completed R.E.A.'s	59,299	4,126	4,932	9,058	68,357
Individual Rurals	1,941	-	-	-	1,941
Farms Supplied by Cities	180	-	-	-	180
TOTAL ACTUALLY SERVED	64,886	4,943	5,518	10,461	75,347

Of these 1,255 farms, 46 of them were in areas that needed assistance of Part II loans which totalled $29,255. The framework of lines in these new Part II areas will make it possible for additional farmers to connect to them whenever they are ready.

Since its inception, approvals of loans under Part II legislation have totalled $2,070,176. As at December 31, 1965, $347,074.43 of this remains outstanding. Out of a total of 336 Part II loans which have been issued to date, 216 have been repaid in full and a great many more are nearly paid off.

The existence of Part II loans made a very definite contribution to farm electrification and made it possible to build a framework of lines in areas which otherwise would have had great difficulty obtaining service. There were 9,884 farmers in these areas and initially 4,134 of them took advantage of this financial assistance to get their lines built. In most R.E.A.'s, once the lines were built, many of the remaining farms hooked on to them within two or three years so that great strides have been made in repaying these Part II loans. As stated, during 1965 Part II loans totalling $29,255 were approved and we expect that during subsequent years this amount will decrease year by year.

Checking Costs, Etc.

During the year, the Commission has checked the cost statements which the companies have rendered to R.E.A.'s, showing the costs of building their lines. In addition to this, some field checks have been made on various farm areas. With very minor exceptions, these costs have always been found to be correct. These checks further show that the areas have

been constructed at cost. The power companies are building these areas at cost and, from an engineering standpoint, they are building them efficiently.

Unfortunately, like in all other construction the cost of building lines keeps going up. The cost of material and labour keeps increasing but these increases are not so serious as that occasioned by having to move crews around to hook up one or two farmers in each R.E.A. The time and cost incurred by this moving around doing a small job here and another there runs up the cost of separate extensions far beyond what it was a few years ago when many farmers were being hooked up as a group in each R.E.A. The power companies have adjusted their crews and the scheduling of these jobs so that as far as possible a farmer requesting service does not have to wait too long, although, unfortunately in spite of this, some problems still arise.

The question of the correctness of operating charges made to farmers is constantly under study. We believe that the power companies are doing a remarkable job of keeping these costs down and of accounting to the farmers for them. In all the years to date, the actual costs have been less than the monthly charges made to the farmer in his power bill so that at the end of each year the power companies have been able to make a refund to the deposit reserves of the associations. The operating charges made in Alberta appear to be reasonable and compare very favourably with those made by R.E.A.'s who are operating in similar territory in the United States. One of the advantages gained by our farmers which enables these charges to be kept low is the rather unique method of operating R.E.A.'s in Alberta. While in the United States the R.E.A.'s

are generally larger than they are in Alberta, each R.E.A. there maintains its own supervisory, office and operating staff, with the result that its overhead is apt to be high. In Alberta, where the expenses of operating R.E.A. lines are pooled over all the farmers being served by any one power company and where, for instance, Canadian Utilities Limited does the operating for over 15,000 farms and Farm Electric Services Limited does this work for nearly 41,000 farms, the overhead from a number of small offices is not added to operating expenses. Moreover under our system, personnel and equipment for operating and maintaining R.E.A. lines is obtained from the power companies' organization as required and the R.E.A.'s are not burdened with idle time of these crews. In other words, the companies operate the farm lines and do the billing and acccunting more efficiently than would be the case if this were being done separately by a number of small R.E.A.'s. Unfortunately, the utmost efficiency in operating these lines is not enough to keep pace with the inflationary rise in material and labour costs. As the lines get older, considerable petty maintenance is becoming necessary and this adds to operating expenses. Increases in cost and inflation are gradually narrowing the spread between the actual costs and the nominal operating charge. The following table shows the operating surplus for the last six years.

Some ten years ago the Power Commission forecast that the excess operating refund would gradually diminish until about 1968 it would disappear. As we approach that year, it appears that that forecast was reasonably accurate. While the 1965 operating figures are not available yet, it is likely that its excess operating refund will be very low.

LINE MAINTENANCE CREW AT WORK

Excess Operating Refund per Member Month

	Farm Electric Services Ltd.	Canadian Utilities Limited	Northland Utilties Ltd.
1959	.53	.69	.02
1960	.51	.44	.02
1961	.45	.56	.13
1962	.24	.52	.29
1963	.20	.43	.50
1964	.18	.61	.66

The decrease in operating refund, of course, is due not only to additional brushing costs, stubbing and pole testing and considerable work on improving clearance of newly graded roads, but it is due to the cost of a sleet storm which was experienced in the central part of the province last spring. It is doubtful if there will be a recurrence of this within one year so that we may expect the excess from operating to increase again during 1966.

In 1950 the average operating expense per farmer per month was $1.66 whereas in 1964 it was $2.06. According to the Dominion Bureau of Statistics, the increase in the consumer price index from 1949 to 1964 was about 35%. That being the case, today's dollar is only equal in purchasing power to what 74¢ was in 1949. If we correct the operating charge of $2.06 and put it in terms of 1949 dollars, it becomes $1.52. The result is that, after correcting for inflation, the operating charge per farm is less than it was in 1949 even though more items, such as brushing, etc., are included in today's operating cost. This means that

the power companies have been effecting considerable economies in operating.

The Power Commission feels that it is its duty to investigate any phases of farm electrification which it believes require study. While the building of farm lines appears very simple and the operation of them is taken for granted, nevertheless, there are many intricate problems to be considered if we are to keep all expenses down to the very minimum. Many questions such as adequacy of Deposit Reserve, system co-ordination to reduce outages on farm feeders and to accommodate for shifts in the loading of lines, the adequacy of the additional operating charge of 50¢ per KVA for yard installations over 3 KVA and the question of rapid obsolescence of some equipment, all merit careful and continuous study. As each of these problems is solved, a new one arises to take its place. For instance, the Power Commission has been watching the withdrawals from Deposit Reserves for various purposes in order to make certain that no money is spent that is not absolutely necessary. In its engineering and accounting aspects, farm electrification is highly technical and the individual R.E.A. does not have the time nor the opportunity to investigate these matters. The Power Commission feels that one of its main responsibilities is to see that consideration is given to every factor that could possibly reduce the cost of electricity to the farmers.

During the past twenty years, as has been mentioned above, the number of farms being operated in Alberta has been decreasing rapidly although in recent years the rate of decrease is not so marked. In 1951 there were 84,315 such farms in Alberta; by 1961 the number had been reduced to 73,212. It appears likely that by 1981 this number will

be further reduced to, possibly, 57,000. On the other hand, of course, the size of farms has been increasing. Whereas the average acreage per farm in 1951 was 525, by 1961 it had increased to 645 acres. Projecting this trend into the future would indicate that the average size of a farm might be of the order of 900 acres by 1981. These changes will be most obvious in grain and mixed farms.

These changes in agriculture are not only inevitable but are all to the good. Actually, agriculture is expanding in every important respect except the number of people needed to turn out the added production. This same greater production is taking place in all industries.

Great changes have been made during the last few years in grain growing. The next decade will probably see most of its changes in the field of livestock production. As our growing economy increases its demand for meat, it is likely that within ten years the demand for livestock products will be one-fourth higher than it is now. During the same interval one-fourth fewer man-hours of farm labour will produce this added output by calling more and more upon electricity.

Today, some eighty-five per cent of the electrified farms in the Province use a 3 KVA transformer. As agricultural production becomes more intensive, the percentage of larger transformers will increase, but quite slowly. While this percentage increase is likely to be concentrated in the irrigated areas, in the areas containing the large wheat farms and ranches, and in the areas within a radius of possibly fifty miles of our cities, it poses some problems in the design and operation of farm electrification lines. As the load per farm increases, the size of substation transformers also has to increase and it becomes necessary in some

R.E.A.'s to increase the wire size on the feeders leading out from the substation. It may be necessary in some cases to change some miles of the feeder lines over to 3-phase.

The decrease in the number of farms and the increase in the size of farms brings with it an increased consumption of power per farm. Even though the number of farms were to remain steady, the consumption would continue to increase, but its effect will be more marked as farms get larger. During 1965, the average Alberta farm used 6,096 KWH. This is more than double the power used per farm ten years ago, and while it is less than that in Manitoba, it is higher than the consumption in Saskatchewan. While farm consumption has doubled during the past decade, the KWH generated per capita during the same period has increased more rapidly.

The map which follows shows the average monthly K.W.H. consumption per member by R.E.A.'s during 1965. In general, the lowest consumptions are found in those areas within Census Divisions 12, 14 and 15. This is partly due to the fact that most of these R.E.A.'s were somewhat late in getting organized and since then have been very slow in approaching saturation. There are still several new customers being added in these areas each year and, since new customers do not use much power in the beginning, the addition of these customers tends to dilute the effect of the higher consumption of farms which have been served for years. The areas of high consumption are those containing large wheat farms, or ranches, and the Milk Shed areas around Edmonton and Calgary. The consumption of power is closely related to the size and type of farm with the larger farm having a larger power consumption. The size and type

of farms is itself largely dependent on the type of soil in the area. The large wheat-growing farms and the ranches in the south are, generally speaking, heavy consumers, while the smaller quarter section-type mixed farms tend to have a small consumption. This is probably a result of higher net income which is reflected in the purchase of more energy-consuming devices.

With this rapid increase in consumption goes an increase in the demand placed on the R.E.A.s' lines and substations. When the original systems for the R.E.A.'s were built they were designed for an average anticipated load of about 300 KWH per month. Since that time the consumption has grown until now the average is over 500 KWH per month and in some R.E.A.'s it is over 700 KWH per month. There was no way of telling in the beginning what consumptions would develop in any area and there was no point in overbuilding the systems at that time. However, provision was made in the deposit reserve that, as the consumption increased, money would be available to take care of the need for increased capacity in R.E.A.'s which turned out to have a large consumption.

Deposit Reserves

The Power Commission continues to make careful studies of the adequacy of the deposit reserves being set aside by the R.E.A.'s. While it has developed a method by which it can assess the adequacy of existing deposit reserves, many assumptions have had to be made. Some of these will prove to have been too optimistic or pessimistic but it is expected that any errors will compensate each other. If experience should prove any of the assumptions to be badly out of line, the annual review will catch this trend before it has gone too far.

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After rather intensive studies for some years, it appears that while some R.E.A.'s have reserves that are building up too rapidly, the majority are fairly well in line with the theoretical figures. Those R.E.A.'s whose reserves have been building too rapidly have been advised that money is available which they can refund to their members, and this has been done in a number of R.E.A.'s. In some R.E.A.'s where the mileage per farm is high, the Deposit Reserve is not going to be adequate. There are not very many of these in the province and the Power Commission has discussed this problem with several of them and they have decided to find ways and means of putting additional money into their reserves. In some cases this has involved increasing the Deposit Reserve portion of their monthly bill by 50¢ or $1.00. More and more R.E.A.'s are beginning to see the necessity of this reserve, and we believe that, on the whole, the picture is quite satisfactory.

The average K.W.H. used per farmer in Alberta today is 6,096 KWH per year. This is much higher than anyone could have foreseen ten years ago. The high use of power, while it is an indication of the value of farm electrification, is making it necessary to increase the size of substation transformers and, in some cases, to increase wire size on some feeders. Provision was made in the deposit reserve to allow for this and in those areas experiencing the heaviest use, this work is being done and is charged to the reserve. While the original lines were designed for what at the time was considered a high use, it was obviously impractical and too costly to build the lines to a heavier standard then. Doing so would have meant that the original farmers would have had to carry a uselessly high investment for many years.

It is becoming apparent that in some R.E.A.'s the poles already need considerable treatment and even some stubbing. While inspection and the pole treatment should be charged into the operating account, we believe that the material used for the stubbing should be paid for out of the deposit reserve account, because this is, in effect, adding value to the existing line.

We look upon the money being paid into the deposit reserve by any farmer in any one year as his share of the depreciation that takes place during that year that he is using the line. Up to this point, due to a number of factors which included putting excess operating charges and excess construction funds into the reserves, the sum of all the reserves has grown very well. Some R.E.A.'s, in noting the rapid growth of their reserves so far, are apt to think that if it has grown at this rate and to this amount already it will keep on increasing at this rate and by 1978, or 30 years from the beginning, it will reach a fabulous amount. Indeed if this rate of increase were to be maintained and no withdrawals were made from the fund, the reserve would grow in that manner.

Two factors are coming into play however to prevent this apparent large increase. One is that fact that, as was anticipated, more and more R.E.A.'s are having to dip into their reserves for larger substation transformers and for what we call inadequacies, i.e. increasing wire size, etc. on some portion of a R.E.A.'s line. Out of 376 R.E.A.'s, 208 have already had to make some withdrawals from their Deposit Reserve. The amounts of withdrawals from the reserve vary with each of the R.E.A.'s, but 10% of those which are less than eight years old have made withdrawals and two-thirds of all R.E.A.'s whose lines are eight or more years old have with-

STORM DAMAGE RESULTING FROM MAY, 1965 SLEET STORM IN THE STETTLER AREA.

Photo by Stettler Independent.

drawn some money. Of 92 R.E.A.'s whose original lines were built fifteen years ago, 90% have made withdrawals.

The other factor that is coming into play is that the monthly input into the fund per farmer is starting to drop and will continue to drop. This past input, however, included not only the ordinary 50¢ per month deposit reserve charge ($1.00 per month in Canadian Utilities areas), but as well excess operating charges which a few years ago averaged perhaps 60¢ per month, and also excess construction funds which have put large amounts into the reserves of the R.E.A.'s served by Farm Electric Services. Both the excess operating and the excess construction funds will drop off markedly during the next three or four years and by about 1969 will not be making any significant contribution to the reserves.

As we have said, if no withdrawals were to be made from the fund and if the high inputs into the fund experienced in the past were to be maintained, we would expect that by 1978 the fund would reach a total perhaps four times what it now stands at. Because, however, withdrawals in increasing amounts will have to be made from here on, and because the annual amounts going into the fund as a whole will decrease, we estimate that by 1978 the amount in the fund will only be double what it is now. By that year, it will reach a maximum. From that time on, heavy withdrawals will have to be made for replacing poles, etc. and the fund as a whole will decrease so that by 1988 we estimate that it will be of the order of $10,500,000. While this applies to the fund as a whole, any individual R.E.A.'s deposit reserve will show more extreme fluctuations.

Peak Load

The annual use of electricity per farmer in Alberta during 1965

has been 6,096 KWH. In the aggregate, although the increase in farm consumption has been rapid, the electricity consumed by farmers continues to account for less than 7% of the total power generated in the province. While the farmers use only 7% of the KWH, however they are responsible for 13% of the peak load. The percentage which the farmers will use of the KWH generated in the province is never likely to exceed 7% of the total output.

But the total KWH that the farmers use is not so significant as the peak load they impose on the generating and transmission facilities. The estimated combined peak load used for farm electrification is at least 140,000 KW. This 140,000 KW is a large proportion of total plant capacity and consequently means that a large proportion of the companies' investment in plants and transmission lines is reserved solely for farmers. The companies' investment in this equipment, which is reserved solely for the farmers' use, will be well over $600 for each farm served. The accompanying chart was prepared from Canadian Utilities' figures and shows the load on that Company's system, hour by hour, for a typical day. The lower line shows the load imposed on the system by farms, the central line shows the load emanating from the rest of the Company's system and the top line shows these two added together to produce the Company's total load. It will be seen that the

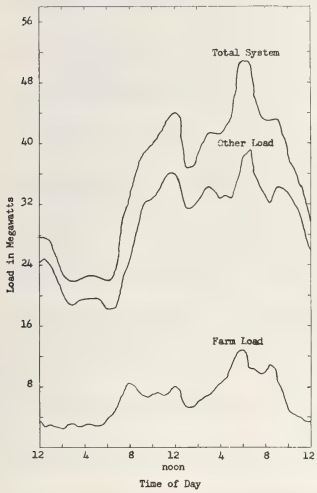


CHART NO. 3

Typical Load Curves for a December Day. Canadian Utilities Ltd.' System.

peak load originating in farms comes on at the same time as the peak load upon the rest of the system.

The average farmer's electric load factor is very low and is something of the order of 27% as compared to a province-wide load factor of about 50%. This question of load factor is an important one and, while it confronts many industries, it bears most heavily on the gas and electric utilities. The highest electric peak load of the year usually happens just before Christmas and may have a total duration of only an hour or so on two or three different days at that time of the year. The power companies have to install enough generating capacity to meet that peak even though for the remainder of the year all of this capacity is not used.

Once the generating capacity is installed, and this is particularly so of hydro plants, the cost of operating it twenty-four hours a day is not such a great deal more than the cost of operating it one hour a day. In other words, the cost of generating 24 KWH per day with one KW of equipment is not much more than generating one KWH per day with one KW of equipment. This being the case, any customer such as a paper mill in the East, for instance, which can use a fairly constant amount of power twenty-four hours a day for 365 days a year can obtain this power very cheaply. Such a customer has a load factor of nearly 100 per cent. An example of a customer on the other end of the scale would be a community hall used for only a few nights during the winter and therefore having a load factor of possibly one per cent. The average load factor placed upon the plants in Alberta is about fifty per cent. That is, on the average the generators produce only one-half of what they could if the load were such that they could run steadily for twenty-four hours a day. Some 140,000 KW of generating equipment has to be reserved solely

for farm use over the peak load period, but for the year as a whole it is only used twenty-seven per cent as much as it could be.

In order to improve their load factor, farmers would not only have to use more electricity than they do now, but would have to arrange their farming operations so as to use the extra power at an off-peak period. This matter has been discussed with the Union of R.E.A.'s. As a result, the Power Commission, Farm Electric Services Ltd., and Canadian Utilities Ltd. made surveys of some farm loads to see what might be done to encourage more off-peak use of power. The studies, which extended over a couple of years, were somewhat frustrating. It appeared that some farmers, by planning their work, could operate some of their energy-consuming devices off peak, and thus improve their load factor. Since the cost of electricity is, on the average, only 0.8% of total farm operating expenses, it is not too practical to expect such careful planning in the use of power. While it is probably not possible to make major changes in farming practice in the use of electricity, nevertheless, this does present an avenue which would lead to reduced power bills so long as all farmers were to work toward that end. It is a subject towards which farmers might direct some thought, in the hope of improving their load factor.

As a result of studies and discussions between the power companies, the Union of R.E.A.'s and the Power Commission, the companies agreed to work out an incentive-type rate which, in a general way, it was hoped would accomplish the same end as that sought by the installation of relays. This investigation resulted in the rate reduction which came into effect at the beginning of 1963. From the beginning of the Rural

Electrification program up to this time, the farm energy rate had always been a flat 2¢ per KWH in the south part of the province with somewhat higher rates in the Peace River Block and other isolated systems which were not part of the interconnected grid. Under the 1963 rate reduction, energy in excess of 400 KWH per month for three or five KVA transformers was to be sold at 1½¢ per KWH. During the first year, after these new rates came into effect, the annual savings to R.E.A. customers were $434,000, or about 8.1%. Under this new rate, the average cost per KWH sold to farmers in the whole province was lowered to 1.87¢.

During 1964, Canadian Utilities Ltd. and Northland Utilities Ltd. made a further reduction in the rates charged R.E.A. farmers in the interconnected system of the Peace River country to bring those rates in line with those in effect in the rest of the province. The annual savings to Peace River farms by this reduction was some $63,000.

In June, 1965 a further province-wide incentive type reduction was announced. Under this, the first step in the rate was cut from 400 KWH per month for 3 KVA transformers to 350 KWH. Then the next 350 KWH per month was 1.5¢ with all additional KWH at 1.25¢. Somewhat similar reductions were made in the case of farm services having larger transformers.

No statistics of the savings to farmers on this last rate change are available as yet, but it is estimated that nearly half of the farm customers in the Province will receive considerable additional benefit amounting in total to more than $200,000 per year. In addition to the monetary saving to farmers, it is hoped that these rates will encourage more efficient use of power on farms. It is difficult, if not impossible, to think of any other service or commodity which has continued to decrease in price over the last years or one which has had such a marked effect on the lives of farm people in the province.

NORTHWEST TERRITORIES

BRITISH COLUMBIA

SIXTH MERIDIAN

FIFTH MERIDIAN

FOURTH MERIDIAN

INDIAN CABINS

32ND BASE LINE

STEEN RIVER

31ST BASE LINE

MEANDER RIVER

30TH BASE LINE

MOUNT WATT

HIGH LEVEL

BOYER RIVER

FORT VERMILION

KEG RIVER

MANNING

WORSLEY

FAIRVIEW

PEACE RIVER

23RD BASE LINE

RED EARTH

WOOD BUFFALO NATIONAL PARK

29TH BASE LINE

28TH BASE LINE

FORT CHIPEWYAN

27TH BASE LINE

26TH BASE LINE

25TH BASE LINE

24TH BASE LINE

FORT McMURRAY

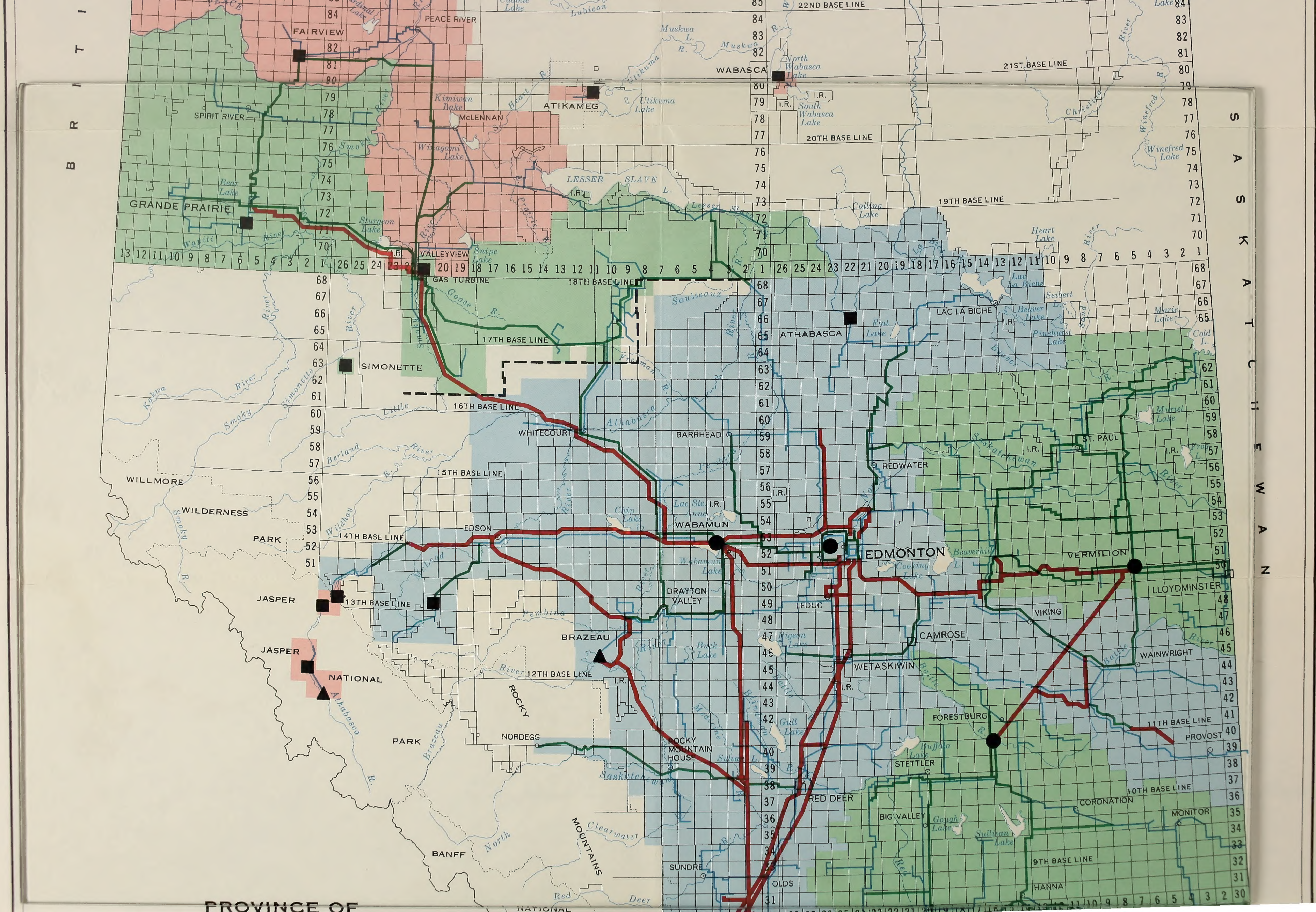
ANZAC

22ND BASE LINE

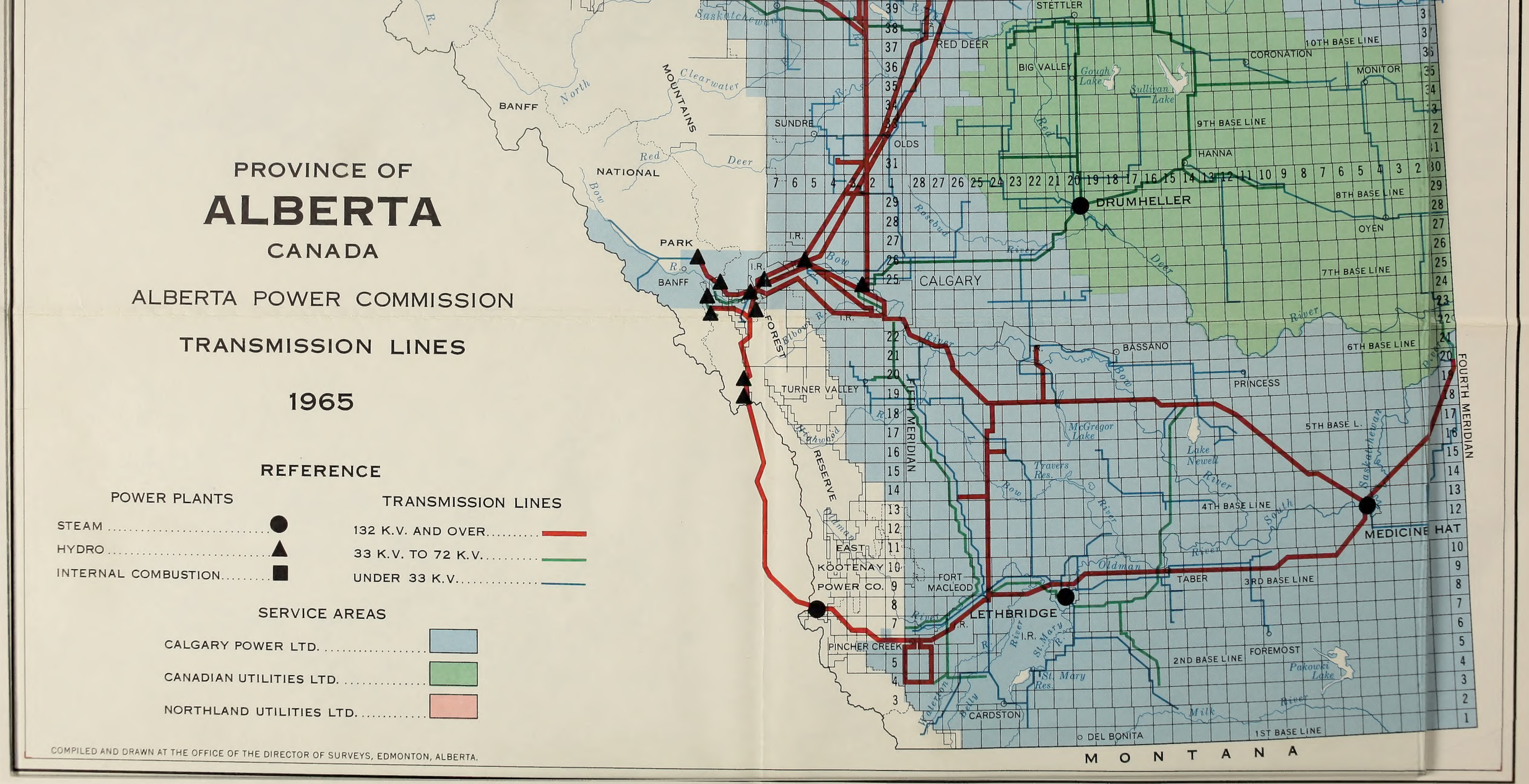
WABASCA

21ST BASE LINE

Petitot River
Bistcho Lake
Steen River
Yates River
Whitesand River
Buffalo R.
Little Rapids Cr.
Hay River
Hay Lake
Zama Lake
I.R.
Chinchaga River
Ponton R.
Wentzel R.
Wentzel Lake
Boyer R.
Peace River
Chinchaga
Notikewin River
Bison Lake
Wolverine River
Wabasca River
Loon River
Cadotte R.
Cadotte Lake
Loon Lake
Lubicon R.
Lubicon Lake
Peerless Lake
Cardinal Lake
Muskwa R.
Muskwa L.
Mikkwa River
Salt R.
L. Buffalo R.
Jackfish R.
Slave River
Lake Athabasca
Andrew Lake
Cornwall Lake
Colin L.
Baril Lake
Lake Claire
Mamawi Lake
Richardson Lake
Old Fort R.
Birch River
McIvor R.
Richardson River
Gardiner Lakes
Namur Lake
Firebag River
Ells River
Mackay River
Clearwater R.
Gregoire Lake
Gordon Lake
Garson Lake
North Wabasca L.



PEACE RIVER
FAIRVIEW
22ND BASE LINE
21ST BASE LINE
20TH BASE LINE
19TH BASE LINE
18TH BASE LINE
17TH BASE LINE
16TH BASE LINE
15TH BASE LINE
14TH BASE LINE
13TH BASE LINE
12TH BASE LINE
11TH BASE LINE
10TH BASE LINE
9TH BASE LINE
WABASCA
North Wabasca Lake
South Wabasca Lake
ATIKAMEG
Utikuma Lake
Kimiwan Lake
McLENNAN
Winagami Lake
SPIRIT RIVER
GRANDE PRAIRIE
Bear Lake
Sturgeon Lake
LESSER SLAVE L.
Calling Lake
Heart Lake
Winefred Lake
VALLEYVIEW
GAS TURBINE
Snipe Lake
SIMONETTE
ATHABASCA
LAC LA BICHE
Lac La Biche
Beaver Lake
Pinehurst Lake
Seibert L.
Marie Lake
Cold L.
WHITECOURT
BARRHEAD
REDWATER
ST. PAUL
Muriel Lake
WILLMORE
WILDERNESS
PARK
EDSON
WABAMUN
Lac Ste. Anne
Chip Lake
Wabamun Lake
EDMONTON
Cooking Lake
Beaverhill L.
VERMILION
LLOYDMINSTER
JASPER
DRAYTON VALLEY
LEDUC
VIKING
CAMROSE
BRAZEAU
Pigeon Lake
Buck Lake
WETASKIWIN
WAINWRIGHT
JASPER
NATIONAL
PARK
ROCKY
MOUNTAINS
NORDEGG
ROCKY MOUNTAIN HOUSE
Gull Lake
Sylvan L.
FORESTBURG
Buffalo Lake
STETTLER
PROVOST
RED DEER
BIG VALLEY
Gough Lake
Sullivan Lake
CORONATION
MONITOR
BANFF
SUNDRE
OLDS
HANNA
PROVINCE OF
B R I T I
S A S K A T C H E W A N


PROVINCE OF
ALBERTA
CANADA
ALBERTA POWER COMMISSION
TRANSMISSION LINES
1965
REFERENCE
POWER PLANTS
STEAM
HYDRO
INTERNAL COMBUSTION
TRANSMISSION LINES
132 K.V. AND OVER
33 K.V. TO 72 K.V.
UNDER 33 K.V.
SERVICE AREAS
CALGARY POWER LTD.
CANADIAN UTILITIES LTD.
NORTHLAND UTILITIES LTD.
COMPILED AND DRAWN AT THE OFFICE OF THE DIRECTOR OF SURVEYS, EDMONTON, ALBERTA.
BANFF
NATIONAL
PARK
MOUNTAINS
FOREST
RESERVE
RED DEER
SUNDRE
OLDS
CALGARY
BANFF
TURNER VALLEY
EAST KOOTENAY POWER CO.
FORT MACLEOD
LETHBRIDGE
PINCHER CREEK
CARDSTON
DEL BONITA
STETTLER
BIG VALLEY
CORONATION
MONITOR
HANNA
DRUMHELLER
OYEN
BASSANO
PRINCESS
TABER
FOREMOST
MEDICINE HAT
10TH BASE LINE
9TH BASE LINE
8TH BASE LINE
7TH BASE LINE
6TH BASE LINE
5TH BASE L.
4TH BASE LINE
3RD BASE LINE
2ND BASE LINE
1ST BASE LINE
FOURTH MERIDIAN
SIXTH MERIDIAN
MONTANA
Saskatchewan R.
North Saskatchewan R.
Clearwater R.
Red Deer R.
Bow R.
Elbow R.
Kananaskis R.
Highwood R.
Sheep R.
Oldman R.
St. Mary R.
Milk R.
Rosebud River
McGregor Lake
Travers Res.
Lake Newell
Gough Lake
Sullivan Lake
Pakowki Lake
St. Mary Res.